Preview: ATI Radeon 9800 Pro XT (R360) & 9600 Pro XT (RV360) ■ Reviewed: AMD Athlon 64 FX-51

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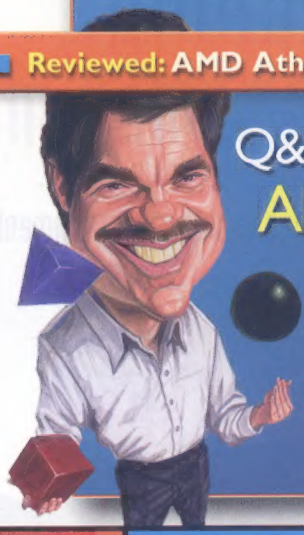

Q&A With Alan Kay

Making Small Talk With The Inventor Of The Smalltalk Programming Language

(page 108)

* What Does The Speedy FAST INTERNET 2 Protocol Mean To You?

(page 40)

* RSS Helps Web Sites Share & Share Alike

(page 44)

* Replace Your Faulty Mobo Capacitors

(page 94)

* Multi-Speaker System Roundup

(page 17)

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Pushes 32-bit To The Limits

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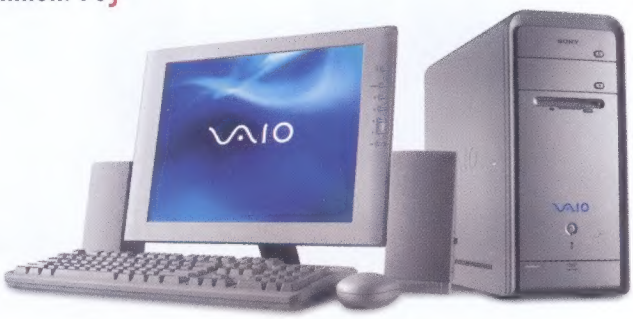

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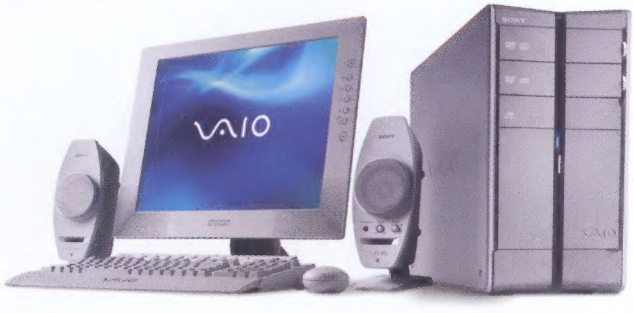

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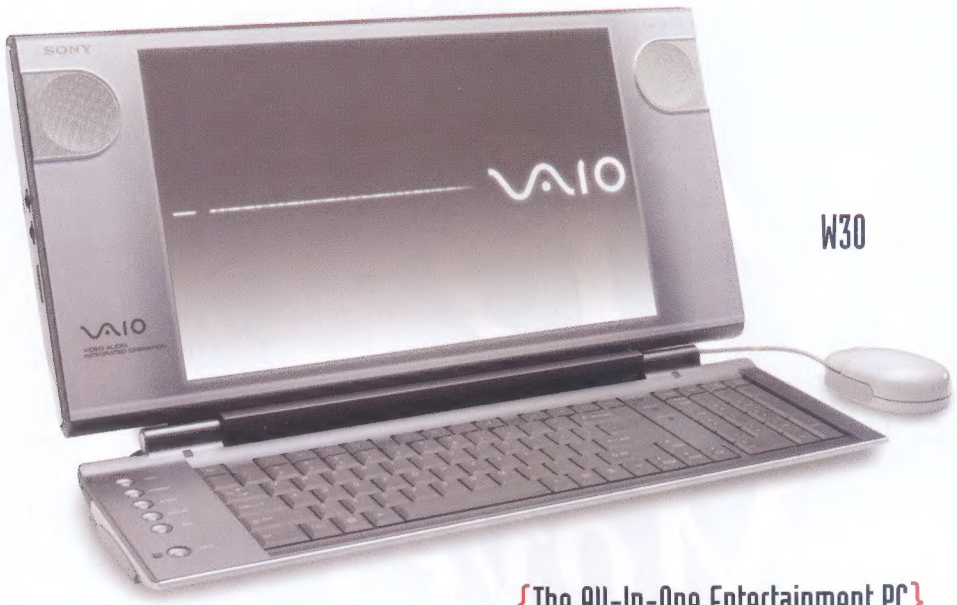

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November 2003 • Vol 3 Issue 11

AMD Makes Its Move

Spotlight

50 **AMD Today & Tomorrow**
The Follower Leads

60 **Everyman's Next Mobo?**
We Inspect Early Athlon 64 Boards To Find Out

63 **The 64-bit Question:**
Are You Ready For The Athlon 64?

Frontside

6 What's Happening
14 Digital Economy
15 **The Saint**
Feeling Safe Yet?

The Experts

Kyle Bennett
[H]ard Talk
page 33

Alex "Sharky" Ross
The Shark Tank
page 32

Alex St. John
The Saint
page 15

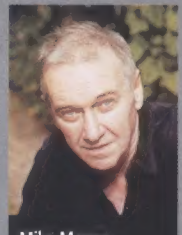
Rob "CmdrTaco" Malda
The Department Of Stuff
page 83

Joan Wood
Forward Slash
page 84

Lisa Lopuck
Site Scene
page 82

Anand Lal Shimpi
Anand's Corner
page 31

Chris Pirillo
Dialogue Box
page 72



Mike Magee
Shavings From The Rumour Mill
page 101

Pete Loshin
Open Sauce
page 73

Did you find the hidden CPU logo on our cover? Turn the page for the answer.

Heavy Gear

16 **Dream Hardware**
These Gizmos Don't Sing It, They Bring It

17 **Speaking Speakers**
We Tune In & Test Out

21 AMD Athlon 64 FX-51

24 ATI Radeon 9800 Pro XT (R360) & 9600 Pro XT (RV360)

26 Plextor PX-504UF DVD+RW 4X/2.4X/12X USB 2.0/FireWire SmartDisk FlashTrax

27 Biostar iDEQ 200T SFF PC
Minolta DiMAGE F300

28 Linksys WPC55AG vs. SMC SMC2336W-AG

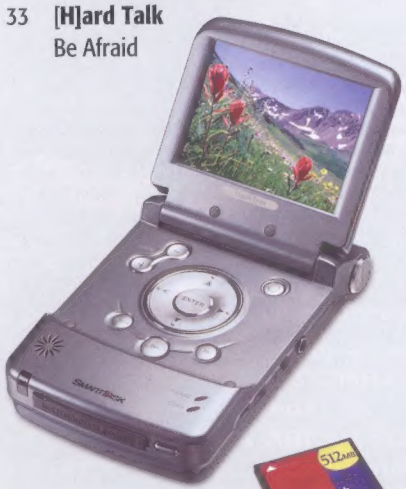
29 D-Link DI-774 vs. Linksys WRT55AG

30 Tadpole SPARC*LE*

31 **Anand's Corner**
AMD's Long-Awaited Winner Is Here

32 **The Shark Tank**
Requiem For A Cheat

33 **[H]ard Talk**
Be Afraid



Hard Hat Area

36 **Swappin' Parts**
CINDI Gets A Drive-In Closet

40 **X-ray Vision: The FAST & The Not So Furious**
The FAST Protocol Should Boost Internet Speeds For Scientists

44 **White Paper: RSS**
The Holy Grail Of Web Site Sharing

Loading Zone

67 **The Bleeding Edge Of Software**
Inside The World Of Betas

69 **Up To Speed**
Upgrades That'll Keep You Humming Along

70 **LindowsOS 4.0**
The Linux-Made-Easy OS Makes Progress

71 Fraps 2.0
Intuit Quicken Premier 2004

72 **Dialogue Box**
Tuning In Alternatives

73 **Open Sauce**
Spinning The Free Web

Caught In The Web

75 **Fringe**

76 **Brilliant Simplicity**
PayPal Makes P2P Pay Off

80 **Coder's Corner: XML**
XSLT, Part 11: XSLT Keys & Indexes

82 **Site Scene**
Web Page Design Strategies

83 **The Department Of Stuff**
adwords.txt

84 **Forward Slash**
WhenU Surf

Digital Living

86 **Road Warrior**
Palm's New Name, More Number
Portability, Verizon Launches PTT Service & More From The Mobile Front

WEB **Pick A Peck Of Helpful Apps**
Top Software For Your Pocket PC, Part 1

88 **At Your Leisure**
Plug In, Sit Back & Fire Away

Tips, Tricks & Mods

93 **Modding Tips & Tutorials**
Let's Recap: Repairing Faulty Motherboard Capacitors

97 **Software Tips & Projects**
Make A Better Class Of Slideshow

99 **Warm Up To Penguins**
Civilization With Style

What's Cooking

101 **Shavings From The Rumour Mill**
Grok This

102 **Technically Speaking**
An Interview With Tim Ryan, M-Audio's Music Man

106 **Under Development**
A Peek At What's Brewing In The Laboratory

Back Door

108 Q&A With Alan Kay

Infinite Loops

Strange stats and other oddball items from computing's periphery

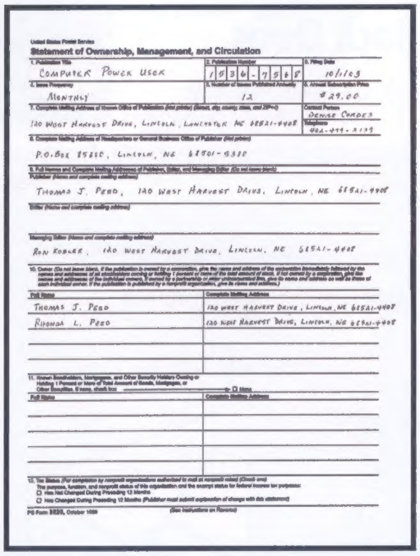
74, 78, 91, 98, 100

Greetings From Samitland

You've seen quite a lot of coverage in *CPU* on Intel technologies in the past two years. For its own reasons, AMD has stayed out of the spotlight . . . until now, that is. I'm happy to say that the folks at AMD took time to sit down with us for an in-depth look at its technologies. There's a lot of brilliant stuff going on at AMD, so I'm sure you'll be as excited as I was to learn about it. There's also a little AMD product called *Athlon 64* just waiting to bust down the doors, so check out our full review on page 21 before you jump to our Spotlight coverage on page 50. Intel and AMD have been at war for a long time. Now AMD makes its move. And as we go to press, Intel is already planning its own move.

Must run (have to help Julie move to Nebraska from Colorado), but I want to hear from you regarding the tech issues you are having. Please send your tech questions to q&a@cpumag.com. We have some very knowledgeable chaps from a Web site I frequent with some regularity that'll get right on the case. I'll introduce them soon enough—though I'm sure their site will need little introduction. I shall look forward to seeing you soon. Oh, one last thing: I wanted to remind you that non-subscribers can access *CPU*'s bonus online material for a month using the code found on the insert before page 103. Enjoy the issue and ready yourself for next month's holiday gift guide! I'll see you back here next month.

Samit G. Choudhuri, Publication Editor, *CPU*



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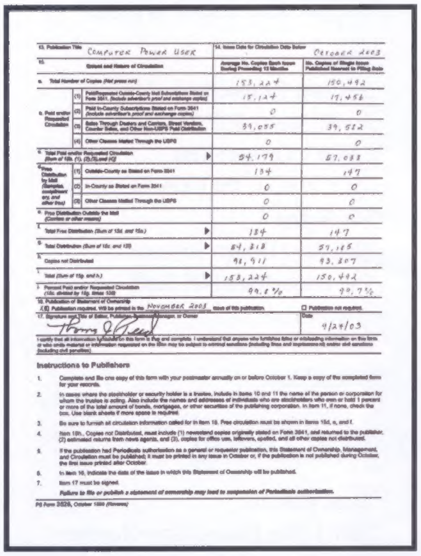

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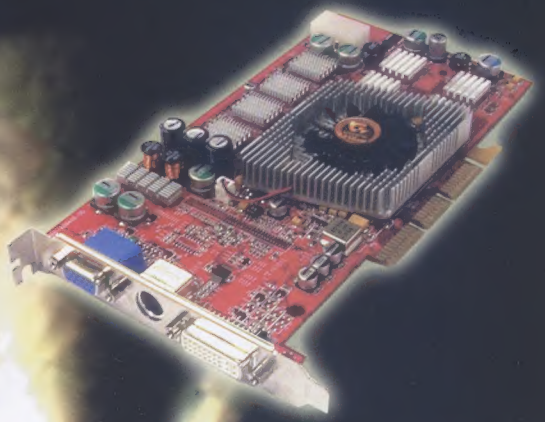
GV-R98P256D 256MB DDR

GV-R98P128D 128MB DDR



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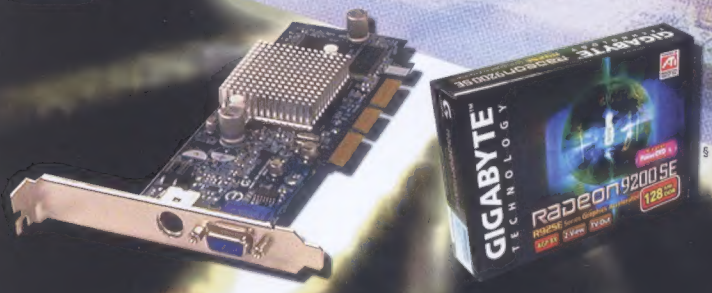
- 256MB/128MB DDR memory accelerates the latest 3D games
- Supports the new AGP 8X standar
- Supports the latest Microsfot DirectX® 9.X and OpenGL® 2.0 feature sets
- 8 parallel rendering pipelines process up to 3 Gpixels/sec
- Brand New 256-bit memory interface
- DVI-I and TV-Out connector supported
- Supports Gigabyte V-Tuner for overclocking and hardware monitor

RADEON 9600

- Powered by the RadeonTM 9600 Visual Processing unit (VPN)
- Fully supports DirectX 9.0
- Supports the new AGP 8X standard
- 4-pixel pipeline architecture
- All new 64-bit memory interface
- 128 MB DDR memory accelerates the the latest 3D games
- First to use pixel shaders to accelerate video
- Supports DVI-I and TV-Out connectors

RADEON 9200 SE



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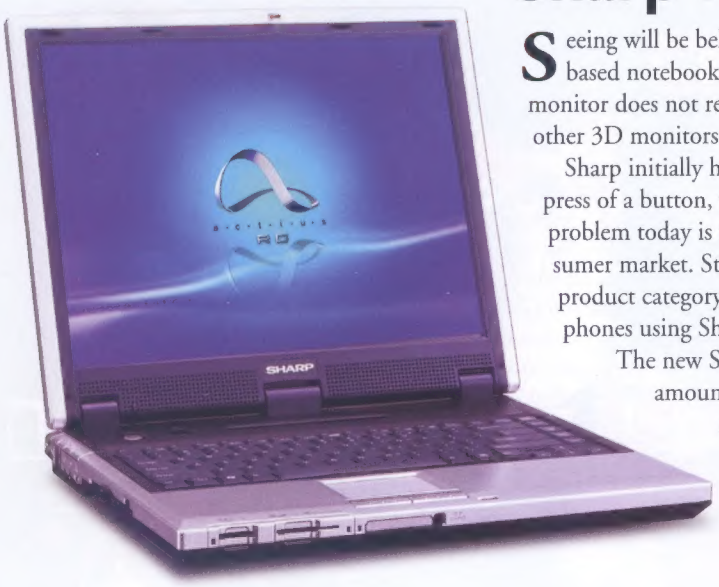
Sharp PC Goes 3D



Seeing will be believing in late October when Sharp releases its first Pentium 4-based notebook PC, the Mebius PC-RD3D, with a 15-inch 3D display. The monitor does not require glasses and is not a basketball-sized globe, drawbacks in all other 3D monitors to date.

Sharp initially hopes the 3D screens, which can switch into 2D mode with the press of a button, will win eyeballs in the gaming and CAD/CAM markets. The problem today is the virtual nonexistence of 3D-based applications in the consumer market. Still, that isn't deterring Sharp, which is betting on spurring a new product category in the relatively saturated PC market. NTT DoCoMo cell phones using Sharp's 3D screen went on sale in Japan last winter.

The new Sharp PC is expected to sell for just shy of $3,000. Of that amount, roughly $500 to $600 will be a premium for the new 3D technology. According to Reuters, the PCs will go on sale in Japan on Oct. 27 and will hit American store shelves at about the same time, although Sharp only expects unit sales to top just over 1,000 units per month. ▲

Maxtor Demos First External SATA II Hard Drive

In case you missed September's Intel Developer Forum, one of the most promising hardware developments shown was the world's first external Serial ATA II-compliant hard drives, a collaborative effort from Maxtor, Silicon Image, and Comax. The overall design reflects work from an early version of the Serial ATA II Cables and Connectors (CabCon) Volume 2 specification being developed by the SATA II Working Group. Maxtor's drive is based on its new OneTouch external enclosure and its DiamondMax SATA hard drive, Silicon Image's SiI 3112TM SATALinkTM PCI-to-SATA Host Controller, and Comax's external Serial ATA cable.

"There are other external SATA devices out there, but they are not SATA II-compliant," says Rich Jorgensen, director of Strategic Marketing at Maxtor. "If they aren't SATA II, then the consumer can't be sure that her product will be interoperable with other standard-compliant devices."

While today's USB 2.0 spec hits 480Mbps and the new IEEE 1394b reaches 800Mbps, Maxtor's external SATA II configuration reaches 1.5Gbps, which should be welcome news to video editors and those doing large backups. However, an upgrade to 3Gbps is already on the drawing board.

The CabCon Volume 2 spec is supposed to be finalized by the end of 2003, so compliant external SATA II devices should hit store shelves in the first half of 2004. Although the spec allows for a wider range of devices, so far hard drives are the only external SATA II peripherals in advanced development. ▲

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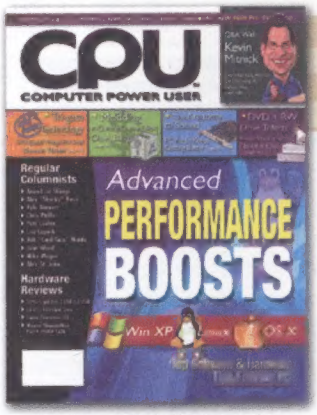

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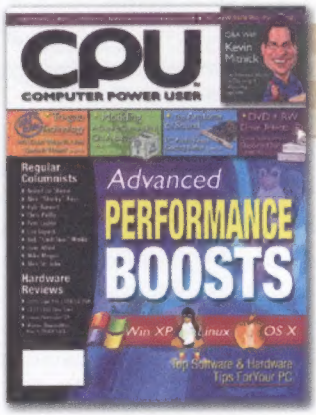

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Forget Talking: Drive With Your Cell Phone

Remote-controlled miniature cars have their own cult following, with options ranging from long-life battery packs to rebuilt engines no bigger than your thumbnail. But soon you may be able to control your Lilliputian roadster with your cell phone.

Japanese games titan Konami teamed up with NEC to create the MICROiR family of devices. With the necessary software downloaded into a compatible phone, a user can direct MICROiR cars by simply using the keypad as a remote control. Japanese toy maker Takara also has a spin-off IR transmitter that plugs into MICROiR phones and costs roughly $34.

Currently, MICROiR support is only available on select NTT DoCoMo phones in Japan, but if the tyke-sized time passer catches on, expect it to export to America and Europe sometime soon. ▲

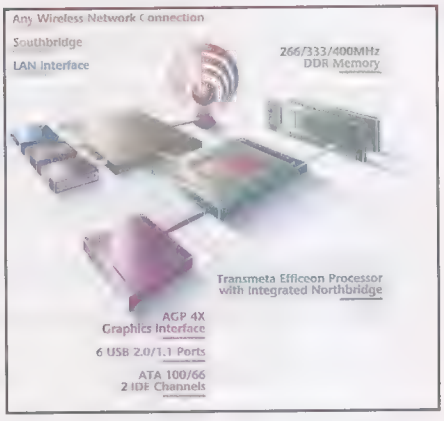
Hardware Mole

Our endearingly myopic hardware mole always has one ear to the ground. Here's his scuttlebutt at press time.

They're Watching You . . . Err, Your Stuff

You already know that police can use data obtained from cellular towers to triangulate your phone's position. Now, Professor Nigel Linge, director of the Centre for Networking and Telecommunications Research at Britain's University of Salford, is working on creating a test with local police forces in which the same technology is placed in regular consumer electronics devices. The chip in the CD player should know about how near it should be to the chip in the TV. If these two become too separated, an alert is sent out, and police can track the whereabouts of the presumably stolen gear.

Cool stuff, right? More ominous were remarks Linge made at the annual meeting of the British Association for the Advancement of Science, in which he indicated that some voices had raised the possibility of installing similar, GPS-capable devices in cars so that factors such as speed could be remotely administered by authorities. That means no more 70 in a 55, Mr. Leadfoot. ▲



Transmeta's New Chip Name: Efficeon

Knowing that its next-generation chip for notebooks and other mobile devices would never fly under the moniker TM8000, Transmeta rebranded its forthcoming line as the Efficeon. The company's answer to Intel's Pentium M promises to run general apps 50% faster and multimedia tasks up to 80% faster per clock cycle than today's Crusoe TM5800. The name Efficeon refers to the word efficient and Transmeta's claim that the chip will deliver "best-in-class performance, per watt, per dollar." Major manufacturers are currently evaluating the new design, and early devices based on the chip are expected to be announced in the fourth quarter. ▲

Cell Phone Bug Repellant

Got mosquitoes? With luck, your cell phone may soon help ward them off. South Korea's top cellular operator, SK Telecom, claims to have developed a "ring" that repels the blood sucking beasties. Users can download the audio clip for about $2.50 from the company's site.

The sound plays constantly but is supposed to be only barely audible—to humans, anyway. SK estimates that keeping the digital DEET running will consume 30% more battery power. To date, no cellular company has officially announced that playing the Fleur De Lis ringer in an endless loop acts as a human repellant, but it does. ▲

Compiled by Dean Takahashi

Intel Goes After Next-Generation Cell Phone Market

Intel is trying to challenge Texas Instruments in the cell phone processor market with its latest PXA800EF cellular processor, which will support the next generation of wireless networks. The chip offers support for the EDGE (Enhanced Data Rates for GSM Evolution) standard, which can stream data into a cellular phone at two to three times the rate of today's 2.5G (generation) GSM/GPRS phone networks. Intel's chip has two built-in processors, a 312MHz Xscale processor, and a 156MHz digital signal processor, both aimed at delivering high performance at low power. By integrating more functions onto a single chip, Intel is hoping the chip will become the heart of a broadband-capable cell phone or PDA. Because the phone is compatible with Intel's Personal Internet Client Architecture, it can run applications and tools developed for other Intel-based cellular phones. The chip will be in volume production in the first quarter of 2004 at a wholesale price of $29.15. ▲

New Chip Packs More Components Onto One Chip

The engineers at Broadcom have been busy shrinking a load of wireless technology into a tiny chip no bigger than a dime. The AirForce One chip, also known as the BCM4317, promises to make Wi-Fi practical for handheld gadgets such as MP3 players, digital cameras, and PDAs. The company says that it combined more than 100 radio components into the single chip, resulting in a device that reduces the power consumption of a Wi-Fi radio by 97% compared to existing solutions. The chip is also 87% smaller than other chips on the market. Heretofore, broadband wireless has been a power-hungry feature, partly because the radio is constantly scanning for radio contact. The 802.11b chip is shipping to early partners and is expected to show up in handheld gear soon. ▲

Korean Graduate Students Design 3D Chip For Handhelds

One of the last frontiers for 3D graphics is portable computing. Many engineers have searched far and wide for a 3D chip to power a handheld computer or GameBoy clone, but the solutions are few and far between because 3D consumes too much power and space to fit in a handheld. But a group of eight graduate students at the Korean Advanced Institute of Science and Technology have designed a chip that can render reasonably good 3D scenes and still fit in a PDA or cell phone.

The design uses the same chip manufacturing process as makers of DRAM chips and can also embed DRAM onto the same chip in order to save space. The RAMP IV chip, designed in a 0.16-micron DRAM process, has 60 million transistors and can run in three modes (power saving, normal, and fast) at a top speed of 132MHz. Ramchan Woo, one of the architects of the design, said his team of students hopes to get funding for a company and then plans to license the design to a chip maker. ▲

Watching The Chips Fall

Here is pricing information for AMD and Intel CPUs.

Released	Original Price	Current Price (9/11/03)	Last Month's Price
AMD Athlon XP 2000+			
1/7/2002	$339	$59	$59
AMD Athlon XP 2100+			
3/13/2002	$420	$60	$62
AMD Athlon XP 2200+			
6/10/2002	$241	$59	$63
AMD Athlon XP 2400+			
8/21/2002	$193**	$73	$75
AMD Athlon XP 2500+			
4/22/2003	$124**	$80	$86
AMD Athlon XP 2600+			
8/21/2002	$297**	$99	$96
AMD Athlon XP 2700+ 333MHz FSB			
11/14/2002	$349**	$123	$129
AMD Athlon XP 2800+ 333MHz FSB			
11/14/2002	$397**	$170	$168
AMD Athlon XP 3000+ 333MHz FSB			
2/10/2003	$634*	$256	$250
AMD Athlon XP 3000+ 400MHz FSB			
5/26/2003	$280*	$268*	$270
AMD Athlon XP 3200+ 400MHz FSB			
5/26/2003	$464**	$442	$453
Intel Pentium 4 2GHz			
8/27/2001	$562	$161	$163*
Intel Pentium 4 2.26GHz 533MHz FSB			
5/6/2002	$423	$168*	$168*
Intel Pentium 4 2.4GHz 400MHz FSB			
4/2/2002	$562	$157	$159
Intel Pentium 4 2.4GHz 533MHz FSB			
5/6/2002	$562	$156	$159
Intel Pentium 4 2.4GHz 800MHz FSB			
5/21/2003	$180*	$168*	$165*
Intel Pentium 4 2.5GHz 400MHz FSB			
8/26/2002	$243**	$204*	$204*
Intel Pentium 4 2.53GHz 533MHz FSB			
5/6/2002	$637	$189	$180
Intel Pentium 4 2.6GHz 400MHz FSB			
8/26/2002	$401**	$203*	$219*
Intel Pentium 4 2.6GHz 800MHz FSB			
5/21/2003	$228*	$207*	$210*
Intel Pentium 4 2.66GHz 533MHz FSB			
8/26/2002	$401**	$188*	$192*
Intel Pentium 4 2.8GHz 533MHz FSB			
8/26/2002	$508**	$259	$259
Intel Pentium 4 2.8GHz 800MHz FSB			
5/21/2003	$278*	$278**	$278**
Intel Pentium 4 3.06GHz 533MHz FSB			
11/14/2002	$658*	$371	$399
Intel Pentium 4 3.0GHz 800MHz FSB			
4/21/2003	$417**	$387*	$392*
Intel Pentium 4 3.2GHz 800MHz FSB			
6/23/2003	$637**	$619*	$641*

Retail price
Manufacturer's price per 1,000 units
Other current prices, if indicated, are lowest OEM prices available through Pricegrabber.com

Microsoft submitted the source code for its Windows Media 9 standard, launched last January, to the Motion Picture and Television Engineers international standards organization. If the group recognizes and accepts Microsoft's code, it would effectively make WM9 open source.

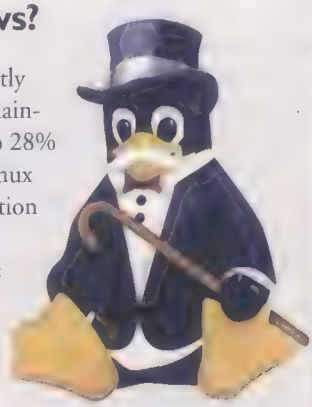
The move comes at a time when increasing numbers of content providers and developers are eyeing WM9's potential in the mass market. Windows Media Video 9 is three times as efficient as MPEG-2, and Windows Media Audio 9 offers a compressed lossless codec, not to mention the capability for 7.1 surround sound.

With WM9 open, it will become much easier for companies to incorporate the platform into their hardware and software products. Open does not mean free, though. Products that encode in Windows Media would need to pay a licensing fee, although Microsoft has indicated that the licensing program would be simple and affordable, marking yet another diversion from standard company practice. ▲

Software Shorts

Here are a few software tidbits we found just before press time.

Linux Costs More Than Windows?



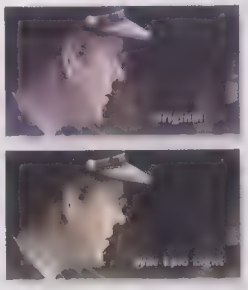
That's the word from Giga Research, which recently released a study showing that licensing, labor, maintenance, training, and associated software cost 25% to 28% more on the Sun-backed Java 2 Enterprise Edition Linux platform than on Microsoft's .NET in certain application types. According to Giga, large companies can anticipate the development and deployment of applications over three years costing $2.29 million with Linux versus only $1.64 million with Windows. For medium-sized companies, the numbers drop to $881,445 for Linux and $661,012 for Windows.

The sample base for the study was fairly small: five companies using Linux and seven using .NET. Giga Research, owned by Forrester Research, is a reputable industry analysis organization, although Microsoft initiated and paid for the study. ▲

The Worm Turns To Good (Kind Of)

Send a maniac to catch a maniac, said the Demolition Man, and that seems exactly what the writers of the Nachi/Welchia/MSBlast.D worm had in mind. In the wake of the Blaster worm's voluminous damage to machines running Windows 2000 and XP, the Nachi worm exploits the same security flaw. The difference is that its payload is designed to download the DCOM RPC patch from Microsoft's Windows Update page, install it, reboot the system, search for other host systems, and then attempt to remove the Blaster/MSBlast/Lovsan worm.

The worm may have come to eliminate its prey, but, like the Demolition Man, it can still leave a swath of destruction in its wake. "Despite its original intent, the W32.Welchia.Worm is an insidious worm that is preventing IT administrators from cleaning up after the W32.Blaster.Worm," said Vincent Weafer, senior director, Symantec Security Response, in a company statement. "The worm is swamping network systems with traffic and causing denial of service to critical servers within organizations." ▲



Look Like Hollywood, Pay Nothing Extra

Adobe Premiere Pro users, take note. If you register your software, you're now eligible to download the Magic Bullet Movie Looks plug-in for free. The plug-in comes via a partnership with Red Giant Software, which sells the full standard version of its Magic Bullet Suite for $995.

Movie Looks includes 10 effects that mimic the look and feel of visual styles from prominent movies. For example, the two Neo effects give blacks a greenish hue, just as in "The Matrix." The Bistro effect uses emerald blacks and golden highlights to simulate the look of "Amelié." If you've been looking for a way to justify the higher cost of Premiere, this may be your answer. ▲

The RIAA Strikes Back—At Kids

The Recording Industry Association of America, which seemingly can't find a piece of good PR to save its life, said in August that it would only target "substantial" music swappers when it subpoenaed identity records on 1,075 individuals from ISPs. Supposedly, the RIAA manually reviewed the obtained records before filing suit against 261 of the offenders.

The first of these to settle with the RIAA was Sylvia Torres, who shelled out $2,000 within 24 hours of receiving the suit. Only it wasn't Torres who was the offender. It was her 12-year-old daughter, Brianna, who took some bad advice and made more than 1,000 songs available from her home PC over the Kazaa peer-to-peer system.

"I am sorry for what I have done," said the seventh grader in a statement. "I love music and don't want to hurt the artists I love."

Immediately after the settlement, RIAA critics jumped to the family's defense. P2P United, a consortium of peer-to-peer network companies, including Grokster, volunteered to reimburse Torres for the $2,000, as did New York radio DJ Brother Wease. Online music vendor MusicRebellion .com, which offers legal and licensed music downloads, offered to give Brianna as much as $2,000 in free goods.

As of this writing, the remaining 260 defendants have yet to settle or go on a counteroffensive. It seems unlikely, though, that they will all receive such generous reimbursement offers. ▲

Microsoft Is Slammed With $520.6 Million Browser Judgment

Big Redmond took a big hit in the courtroom when a Chicago federal jury awarded Eolas Technologies more than $500 million for patent infringement damages.

While Eolas founder and President Michael Doyle was still at the University of California, he obtained U.S. patent number 5,838,906, which covered the means by which applets and plug-ins can be embedded in Web pages and manipulated through Web browsers. Eolas claims that Microsoft lifted its technology in 1999 to make Internet Explorer a stronger competitor against Netscape Navigator. The court agreed. Microsoft will appeal the decision.

"It's important to note that the court has already rejected claims that there was any willful infringement," Microsoft replied in a formal statement. "We believe the evidence will ultimately show that there was no infringement of any kind, and that the accused feature in our browser technology was developed by our own engineers based on pre-existing Microsoft technology."

The W3C Web standards body followed with a letter from COO Steven Bratt stating: "Microsoft has indicated to W3C that they will very soon be making changes to its Internet Explorer browser software in response to this ruling. These changes may affect a large number of existing Web pages."

Although the ruling may herald the end of oft-bashed ActiveX controls in Web pages, don't rejoice yet; Microsoft is, after all, the master of the appeal process. This ruling may also spill over into other companies' technologies, including plug-ins from the likes of RealNetworks, Adobe, and Macromedia, to say nothing of considerably smaller companies that create custom or niche solutions for vertical industries. ▲

> "It's important to note that the court has already rejected claims that there was any willful infringement."

First Signs Of Weakening Spam

According to a new report from Internet marketing company DoubleClick, the average revenue generated by one retail or catalog email in the second quarter of 2003 was 28 cents. In the same quarter of 2002, the amount was 29 cents. Moreover, the average order resulting from such messages dropped from $102 to $98.

That said, DoubleClick showed that Internet users were opening more unsolicited mail provided it was from a recognized brand. Financial services still seem to fare the best via spam, with 48% of recipients opening the messages.

DoubleClick noted that for every 1,000 messages sent out, an average of 2.65 purchases are made. Each message costs senders roughly 2 cents. So do the math: One thousand messages costs a spammer $20. Ninety-eight dollars multiplied by 2.65 purchases is $259.70—a return of about 13 times. Still wonder why you get so much spam? ▲

iTunes Breaks 10 Million

Many view Apple's iTunes music service as the poster child for legal song downloading. Thus it was something of a major landmark when Apple announced that the 10 millionth download, Avril Lavigne's "Complicated," was purchased at 11:34 p.m. on Sept. 3.

iTunes charges users 99 cents per song, and there is no restriction on the number of CD burns. Users can play songs on as many as three computers, and there is no limit on the number of copies users make to portable players—provided those players are iPods. ▲

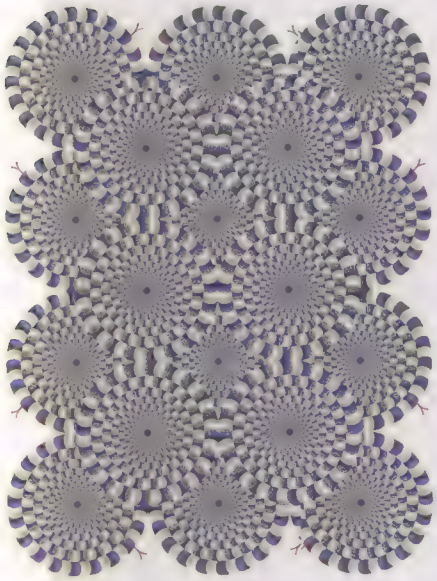
Streaming Real Strong

Following on Apple's heels, RealNetworks revealed that its newly acquired RHAPSODY service streamed out 16 million on-demand songs in August, or more than half a million per day, marking 24% growth in August alone. Real reports that the number of streams sent doubled over the preceding five months.

RHAPSODY lets subscribers (subscriptions cost $9.95 per month) compile CDs to burn for only 79 cents per song but has not released recent numbers on how many songs have been sold through its service. ▲

New & Improved On The 'Net

Looking for some new surfing destinations? Here's a sampler of the many sites that recently hit the Web.



You're Going Through A Forest . . .

The spirit of the old stoner gag is alive and well at The Latest Works site (www.ritsumei.ac.jp/~akitaoka/saishin-e.html). This collection of dizzying optical illusions from Akiyoshi Kitaoka may delight, frustrate, or nauseate—or maybe all three at once. Surf on by and give it a spin . . . literally. ▲

The Best Thing Between Sliced Bread

And once you've drained your brain on illusions, then blown half your day on a computer game, you'll probably be famished. No problem! You need a sandwich, a good one. But what's the best use for two pieces of bread? You can find the answer at The Sandwich Project (iliveonyourvisits.com/sp), a low-key compendium of nearly 1,000 favorite sandwiches submitted from users the world over. Bon appétit! ▲

Bring A Towel

If you loved the five-part "Hitchhiker's Guide to the Galaxy" trilogy (yes, five-part . . . get it?), you probably also caught the interactive text game from Infocom based on the stories. Well, at last your dreams have been realized: The Zork-like adventure is now available for free online. Check out www.douglasadams.com/creations/infocomjava.html and don't panic. ▲

BIOS Upgrades Available Online

Before you send another motherboard to the landfill, consider upgrading the BIOS and giving your PC a new outlook on life. Here are a few recently released upgrades. Subscribers can check out www.cpumag.com/cpunov03/bios to see our entire upgrade list.

Motherboard	File (Date Available)	URL
ABIT IC7	17 (09/03/2003)	www.abit-usa.com/downloads/bios/bios_revision.php?categories=1&model=5
AOpen AX4SG Max	R1.05 (08/23/2003)	download.aopen.com.tw/downloads/default.asp
ECS K7S5A Pro PCB 5.0	030811 (08/25/2003)	www.ecsusa.com/downloads/k7s5a_pro.html
GIGABYTE GA-8KNXP Ultra	F6 (08/18/2003)	tw.giga-byte.com/Motherboard/Support/BIOS/BIOS_GA-8KNXP%20Ultra.htm
Intel D875PBZ	P12 (08/22/2003)	www.intel.com/design/motherbd/bz/bz_bios.htm
MSI 875P Neo (MS-6758)	1.7 (8/29/2003)	www.msicomputer.com/support/bios_result.asp
Shuttle AV49V / AV49VN (AV49V V1.0b)	av49vs04.exe (8/12/2003)	www.shuttle.com/hq/support/download/download.asp
Tyan Thunder K8S (S2880)	V2.01 (08/20/2003)	www.tyan.com/support/html/b_s2880.html

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- *12.1" XGA Display*
- *40 GB HDD[2]*
- *CD-RW/DVD Combo Drive*
- *Sony exclusive digital editing software package*
- *1-Year Limited Warranty[3]*

Wireless Mobility. Serious Power.

Nicely Equipped $2,239.99

- *Mobile Intel® Pentium® 4 processor 2.40 GHz[1] – M*
- *Microsoft® Windows® XP Home Edition*
- *Integrated Wireless LAN[6]*
- *Under 4.4lbs.[5]*
- *512 MB RAM*
- *12.1" XGA Display*
- *60 GB HDD[2]*
- *CD-RW/DVD Combo Drive*
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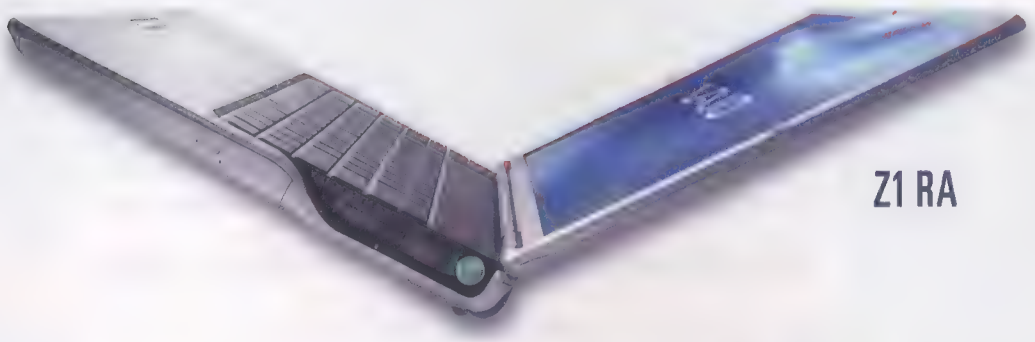

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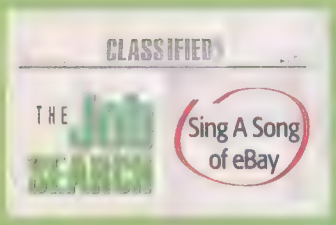
Compiled by Steve Smith



Most evangelists we know pop up on obscure extended cable channels at 3 a.m., but eBay has a spot for a special kind of proselytizer. The Technical Evangelist at eBay is an opening for a true believer in the gospel of online auctioneering. Your job will be to convince third-party software developers to write applications on the eBay platform that make buying and selling easier for everyone. In turn, you work as an advocate for these external developers in getting cooperation from many of eBay's own departments and encouraging new features that outside developers want and need. And this isn't all glad-handing and backslapping. You need to have strong ties to the developer community and Java experience so you can talk the talk. Most of all, you should be an auction fan yourself. According to eBay, candidates who have experience using eBay themselves are highly preferred. ▲

eBay™

Raw Data

40%

Percentage of Honolulu Internet users with a broadband connection at home, the highest broadband penetration in the United States
Scarborough Research

51.4%

Share of Palm OS-based PDAs shipped worldwide in Q2 2003

604,111,719

The number of Internet users worldwide
CIA Factbook

6%

Percentage of Lynchburg/Roanoke, Va., with a broadband connection at home, the lowest broadband penetration in the United States
Scarborough Research

20%

Percentage of enterprises that will experience a serious (beyond virus) Internet security incident through 2005
Gartner

It's Not An AOL World Anymore

In the ISP market of the 1990s, America Online literally dwarfed all other providers, but those days are gone. After years of positive growth, the 500-pound gorilla of ISPs is showing signs of weakness, now registering subscriber loss. Although upcoming rival MSN also suffered some drop-off in subscribers in Q1 2003 as users flock to broadband, the No. 2 provider overall has nabbed a 10.5% share of the market to AOL's 31.5%, according to ISP-Planet. When it comes to high-speed access, however, Comcast may be on its way to becoming the new AOL, adding 400,000 subscribers to its cable-modem business in a single quarter. Generally, the ISP market is now a zero-sum game in which companies must steal market share from one another. Despite this consolidation, ISP-Planet reports that 28.1% of ISP subscribers (23.4 million) continue to use smaller and local providers with fewer than 100,000 customers. ▲

Top 10 U.S. ISPs (Q1 2003)

Rank	ISP	Subscribers (in millions)	Market Share	Subscriber Growth (Q4 2002 to Q1 2003)	Percentage Change From Previous Quarter
1	AOL	26.2	31.5%	-288,200	-1.0%
2	MSN	8.7	10.5%	-300,000	-3.3%
3	United Online (NetZero/Juno)	5.2	6.3%	200,000	4.0%
4	EarthLink	5.0	6.0%	0	0%
5	Comcast	4.0	4.8%	400,000	11.1%
6	SBC Communications	2.5	3.0%	0	0%
7	Verizon	1.8	2.2%	30,000	1.7%
8	Cox Communications	1.6	1.9%	200,000	14.3%
9	Charter Communications	1.3	1.6%	N/A	N/A
10	BellSouth	1.1	1.3%	N/A	N/A

by Alex St. John

Feeling Safe Yet?

My company network is down today as the Blaster virus rampages wildly across our internal systems. Apparently a computer somebody brought from home to test in our QA lab was the culprit. Microsoft had used its critical update service in July to push a patch that blocked the virus. Our network was down six minutes after the virus got in. All the office computers that had accepted the critical update were immune, but it only took a few vulnerable machines to bring down our network.

Lately the press and some errant hackers have been having a lot of fun at Microsoft's expense. Hackers like to find and exploit the many security flaws in the Windows OS and the media gleefully publicizes them. It all seems like a grand joke on The Empire. Consider, however, that in the interest of protecting your security, Microsoft has increasingly taken steps to increase its direct access to your computer with its critical update service and increasingly shut off access to functionality that might be deemed a "security hole" even if that functionality might be equally useful to a legitimate independent software developer.

The widespread distribution of Microsoft's update technology has created a new kind of Internet virus.

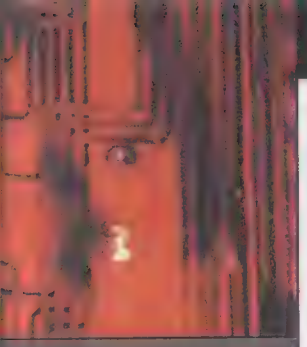
What does it mean for Microsoft to have direct access to most of the world's computers via its critical update service? It means that if there is a serious bug, virus, or security flaw, Microsoft can fix it almost immediately across millions of online machines. Good, right? What happens if Microsoft and Sun get into a tiff over Java and a court orders Microsoft to delete the world's installed base of MSJVMs, thereby breaking millions of pieces of content and Web services? How about this one, what if Microsoft loses a patent suit over some critical OS technology and a court orders them to patch all Windows browsers to remedy the patent breach, breaking most of the rich media content on the Internet? Sound far-fetched? Both are perilously close to happening now.

In the case between Microsoft and Sun, the court issued an injunction this spring requiring Microsoft to delete the installed base of MSJVMs and replace them with the Sun JVM using its critical update service, even if this action wreaked havoc with applications and services that were not compatible across both Java versions. Thankfully the appellate court overturned this particular injunction. Given the fact that Microsoft's license with Sun to modify the MSJVM runs out in January 2004, they might just issue a critical update to delete them all anyway in anticipation of possible security flaws or bugs that Microsoft will no longer be allowed to fix.

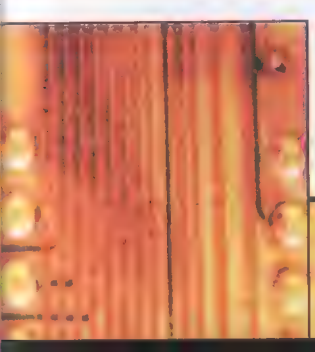
Microsoft also just lost a $520 million patent lawsuit to Eolas Technology—a one-man company in San Francisco that patented browser plug-ins. Naturally Microsoft will be forced to modify Internet Explorer in such a way as to prevent the offending behavior that will probably break Macromedia Flash and Shockwave plug-ins, Java, Adobe Acrobat, and many other popular browser-enhancing technologies. No biggie, right? You'll just use an older version of IE? Nope, Microsoft says that the court ruling may *force* it to issue a critical update patching the installed base of existing browsers to prevent them from violating the patent. Say goodbye to the Internet as you knew it. Hey, at least .NET will still work.

The widespread distribution of Microsoft's update technology has created a new kind of Internet virus. It's one that infects your computer through the courts. Because I think I'm the first to identify this new species of virus, I'm going to christen them "Law Viruses." Law Viruses act by issuing court-ordered "denial of service" attacks on core functionality you have come to expect from your computer. They thrive in "secure" environments where critical update services and closed proprietary architectures protect their victims from ordinary Internet viruses. The greater the access and control Microsoft has over our computers, the easier it will be for the government and courts to require Microsoft to police them. I'm not sure this is entirely bad news for Microsoft anymore than it was for Ma Bell when the government required them to support telephone wiretapping, but I think it's bad news for us. ■

Have thoughts on this? Send them to TheSaint@cpumag.com.



Alex St. John was one of the founding creators of Microsoft's DirectX technology. His exploits in the creation of the modern PC game industry are chronicled in books like "Renegades Of The Empire," "Opening The Xbox," and "Masters Of DOOM." Today Alex is CEO of WildTangent, a technology company funded by investors such as Sony and ATI, devoted to online game publishing. WildTangent's online gaming platform has more than 45 million users across the Internet. WildTangent is also Microsoft's chosen developer for the Xbox Music Mixer, an Xbox Live-enabled, next-generation media player.



Dream Hardware

With all the excess and indulgence of typical Dream Hardware, it's easy to forget how much new technology can really help people these days. One laudable example is the iBOT, which can make so many more places handicap-accessible. Another, on a lesser scale, is the wireless Web pad-remote control bundled with Sony's latest plasma HDTVs. Of course, if your challenge in life amounts to little more than parallel parking, there's always the new Toyota that does the parking for you.

by Marty Sems

2004 Toyota Prius

Some sage once remarked that there are two things a man must never admit he's bad at. One I can't discuss in a family magazine. The other is driving. Those who need a little help with the latter should check out the 2004 Toyota Prius gas-electric hybrid vehicle (U.S. base price $19,995; www.toyota.com). One of its options, Intelligent Parking Assist (about $1,970), lets the Prius park itself by analyzing available space and deciding how to proceed, steering electrically. Sensors watch out for curbs and other cars, avoiding scrapes or scratches. The 2004 Prius is currently available in Japan but will be coming to the States (without Intelligent Parking Assist) next year. Before you laugh, remember that in the old space sim Elite, one of the first upgrades you wanted to buy for your ship was a docking system to automatically park you in those spinning space stations. On second thought, go ahead and laugh. Next up: A robot named Joe will keep your wife company while you're busy "parking."

Sony Plasma WEGA KDE-P50HZ1 With Palette Display

While the rest of the world tries to come up with a use for tablet-style computers, Sony has turned one into a sweet remote control. The tablet, called a Palette Display, controls Sony's new KDE-PxHZ1 Plasma WEGA HDTVs using an 802.11a wireless connection (www.sony.jp/products/Consumer/wega/plasma/hz1 [site in Japanese]). The user can surf the Web on the Palette Display, but the cool part is the way she can transfer content from the tablet to the plasma screen and vice versa. Using Sony's Airtact system, the user can wave her hand across the Palette Display's screen to "throw" content back and forth, plus change channels, of course. The 50-inch KDE-P50HZ1 costs about $11,900, and the 42-inch KDE-P42HZ1 sells for about $9,750. Both Plasma WEGAs should be available in Japan by the time you read this, but it's still up in the air when or if they will reach the United States.

iBOT Mobility System

Dean Kamen, creator of the Segway, is back. This time, he's come up with a gyroscopically-balancing transport mechanism to help disabled people go places that were previously very hard to reach. The iBOT Mobility System ($29,000; www.indetech.com/index.html) can roll along on four wheels over gravel and uneven terrain; but that's not all. Its unique transport mechanism lets it climb and descend stairs and 4-inch curbs, and even balance on two wheels to raise its driver to extend her reach. As with the Segway, the iBOT's balance comes from gyroscopes and redundant computer control systems. The transport has a 6mph top speed and an all-day rechargeable battery. The Mobility System's intended clientele requires a higher level of safety in the design of products like this, but the FDA recently gave the iBOT its approval.

Speaking Speakers

We Tune In & Test Out

Altec Lansing 5100
$179.95
Altec Lansing
www.altecmm.com

Creative MegaWorks THX 6.1 650D
$399.99
Creative
www.creative.com

Klipsch ProMedia Ultra 5.1
$399.99
Klipsch
www.klipsch.com

Logitech Z-680
$399.95
Logitech
www.logitech.com

MidiLand MX-5
$149.95
Midiland
www.midiland.com

Speaker reviews are tricky. I can't present you with a phalanx of benchmarks and say, "Ah, you see, this one scored five points higher than that one." The process is much more subjective—a bit like reviewing wines or furniture, but with one big difference: With a wine, quality can vary widely between tasters. With speakers, my objective was realism. Good source material played through good speakers should make you feel like you're there. And given that performance speakers are likely to play to the ears of discerning audio and video enthusiasts, not to mention gamers looking for the immersive experience, "being there" was my chief criterion.

To test, I selected a range of audio and video material. For audio, I selected "Money" from Pink Floyd's live "Pulse" album, several tracks from Enigma's "MCMXC a.D.," and Fleetwood Mac's "Rumours" on DVD-Audio. For video, I used "U-571's" depth-charging scene, the pod race finale in "Star Wars: Episode I," and the perennial must-have lobby-shooting spree in "The Matrix."

For a sound card, I used Creative's Audigy 2 Platinum for up to 6.1-channel support and extremely low noise. As you read this, the 7.1-capable Audigy 2 ZS will be out, but we were unable to grab one in time for this roundup.

Altec Lansing 5100

After spending a half hour with the 5100 set I kept thinking, "If I lived in an apartment, these speakers would be perfect." That's because in an apartment you can't go nuts with a subwoofer. The 5100 does deliver passable bass. On a studio album, such as "Rumours," the sound was excellent. Altec does the listener proud with extremely crisp highs that make strings and high percussion snap. I didn't notice a bass fall-off until I changed to

Altec Lansing 5100

Enigma's dance beats, and then it became obvious on Pink Floyd's live album, which sounded good but didn't create that essential "being there" illusion. At full volume, the low ranges can get muddy on deep beats.

If anything, the highs from the twin neodynium drivers might have been too good because in quiet segments I could pick out a fair bit of hiss I didn't notice with other sets. This may be the 5100's relatively low 70dB SNR (signal-to-noise ratio) at work. Overall, the set gives a response from 32Hz to 20KHz. The sub features a rear port (hollow acoustic tube for better reverberation) and two front-firing 4-inch drivers. This approach of 4 inches plus 4 inches doesn't equal 8-inch bass. The enclosure is wood, but it feels like plastic in the hands and ears.

In the movie tests, the lack of authoritative bass became even more telling. Depth charging in "U-571" was fair but not terrorizing, and the awe-inspiring "thud, thud, thud" of "Episode I's" pod was entirely absent. And when the security guard gives his expletive response to Neo's strapped-on arsenal, a strong woofer rumbling as all that metal is revealed should have your heart pounding with anticipation. I missed that with the Altecs. During the shootout I noticed the 5100 did a good job of separating left and right channels, but a fairly poor job of separating front from rear.

That said, the set is attractive and well suited to tight quarters. Satellites are 7W per channel, 22W on the center, and 23W on the sub. This is fine for a desktop environment if you have to keep the volume down. The wired remote slips into a buffed-metal cradle; it controls the mode (stereo x2, 4.1, and 5.1) and has a Power button and a knob with LED indicators for adjusting volume, bass/center, and treble/rear. Speaker jacks are mini (at the sound card) to RCA, which is a step up from mini and a step down from bare-wire spring clips, such as those Klipsch uses.

If your speaker budget tops out at $200, you won't regret buying the 5100s.

CPU Ranking: 0 = Absolutely Worthless 2.5 = Absolutely Average 5 = Absolutely Perfect

Creative MegaWorks THX 6.1 650D

You will, however, still dream about moving to a place where you can take advantage of a nicer speaker set.

Creative MegaWorks THX 6.1 650D

The 650 was the last set I reviewed, and I may have already been prejudiced by the Klipsch and Logitech systems. A few negative impressions as I unpacked the 650 further aided this bias. The 70W satellites are feather light and feel like hollow plastic, even after screwing on their rubberized stands. The center stand, which swings the speaker up and down, was so flimsy a slight nudge collapsed the speaker to its lowest position. The 150W subwoofer, with its 8-inch bottom-firing driver, is sturdy and labeled well, but it's noticeably lighter than the Klipsch and Logitech subs. Other small details also bugged me. For example, Creative uses a thicker-gauge speaker wire (perhaps for better shielding), but thicker wires are harder to bundle. In addition, the exposed copper wire ends were frayed rather than being tightly twisted.

This is nitpicking, as the proof of quality comes when you close your eyes. The Enigma CD in 2.1 proved surprisingly good. The highs were brilliant without being too sharp, the mid-range felt full, and the bass, although not as thunderous as the other $400 sets, was strong. During a "Matrix" shooting spree, the exceptional front-rear separation (the best of any set here) dazzled me. This is undoubtedly the work of the extra rear-center channel, although the improvement is most likely from having more sound in the back because "The Matrix" is encoded in 5.1.

"Episode I," however, supports Dolby EX, but the only difference I found from 5.1 was the rear channels felt too strong. I quickly used the wired remote to throttle back on the rear feed. Perhaps more than any test, the pod race exposed the 650's chief weakness: its sub. Bass response was good—the unit reproduces down to 25Hz—but it never felt as clean as the Klipsch and Logitech subs. There's a point in the pod race where the contestants drop off a cliff and bang into the earth below. The Logitech set smacks you in the chest here. The effect was less dramatic with the 650. In "U-571," the depth-charge splashes lack the extra degree of realism that makes you want to grab for your rain slicker; the explosions are big and strong but not dangerous. When I bumped up the bass level, it only made the entire scene too deep and muddy. Moreover, I noticed in several tests that as I lowered the volume, the bass needed increased, which I didn't notice with Klipsch or Logitech.

Chances are, if you don't hear a Klipsch or Logitech set right before listening to the MegaWorks 650, you'll think you've died and gone to heaven. This is a THX-certified set, after all, and the sound is extraordinary, even if it isn't perfect. I did find that after using Creative's button-only wired remote that I definitely prefer knob controls. The remote does feature a headphone jack, and there's a line-in mini plug on the sub.

In the end, it appears the 650 evolved as a way to promote Audigy 2 sales and vice versa. When filling a big living room, there may be a distinct advantage in having that rear center, but it seems unnecessary on the desktop. I'd rather see Creative save the cost of the extra channel and use it to attain the same quality levels as its competitors at the same $400 price.

Klipsch ProMedia Ultra 5.1

Reviewing ProMedia speakers is like reviewing "Raiders of the Lost Ark." How can you do it without resorting to hyperbolic words such as "absolutely," "incredible," "stunning,"and "OHMIGOD!" Well, I'll try.

The Ultra 5.1 set is good—very, very insanely good. ProMedia devotees will find the subwoofer in this new flagship

Klipsch ProMedia Ultra 5.1

CPU Ranking: 0 = Absolutely Worthless 2.5 = Absolutely Average 5 = Absolutely Perfect

The Ultra 5.1 set is good—very, very insanely good.

revamped such that the old front-oriented, round-acoustic port is now an oval slashed across the bottom of the rear wall. Two side-firing 8-inch fiber composite drivers deliver 170W of bone-rattling bass, and it sounds even better than the last Klipsch sub, if that's possible. You can also add a secondary Klipsch SWS sub if you need even more bass, perhaps for testing the reliability of your walls.

The 60W-per-channel satellites meld 0.75-inch metal polymer dome tweeters with MicroTractix horns. The highs were clear, if not crystalline. I expected the sound of loud, breaking glass to set my eardrums crackling. They didn't, and this is my only quibble with this set. This ever-so-slight difference in high-range execution is what gives Logitech its winning lead.

With a 25Hz to 20KHz range, the precision of reproduction was excellent. When the Germans start dropping depth charges in "U-571," my first impulse was to draw back for fear of getting wet; it sounds *that* realistic. You can hear individual droplets "spat, spat" onto the deck. Case shells in "The Matrix's" lobby-shooting spree tinkle all around you. Pink Floyd's "Money" feels like you're watching the sax solo from about the 10th row. On "Rumours," you can clearly hear the acoustic guitar strings rattle on the fretboard.

At first, I was leery of the "control tower" that is Klipsch's wired remote; it actually lies flat on your desk. With a numeric LED readout and a dial knob big enough to curl your fist around, the remote lets you independently control levels for the rear, center, and sub channels. This proved quite handy depending on the listening material. The remote's front also features a mini-plug headphone jack and a line-in port for portable music players. Knowing that most MP3 devices are sadly underpowered, Klipsch applied a 10dB boost on this line.

With 500W of total peak power, I didn't come close to pushing the volume envelope on this set. The maximum output at the listener's location is rated at 115dB, which is literally louder than a jet fighter screaming 1,000 feet above your head. Whether quiet or cranked, I have nothing but superlatives to laud upon this masterpiece of sonic engineering. Klipsch does it again.

Logitech Z-680

After the Klipsch set, I expected a let down. After all, Logitech is known for its mice and keyboards. However, as soon as I dropped in Floyd's "Money," I knew Klipsch had met its match. When I switched to "U-571," I was sold on Logitech's shock-and-awe subwoofer. But during "The Matrix's" lobby-shooting spree I realized all preceding speakers, Klipsch included, had never quite captured the convincing sound of gunfire. The Z-680s seized that extra bit of snap at the high end, relayed every nuance at the mid-ranges, and hit right between the eyes with a palpable "thwap" of recoil in the bass.

I kept thinking, "This is unbelievable. These are the best. Everyone must buy these." Then I listened more closely, trying to forget the brilliant fidelity, and concentrated on sound separation. And I made an incredible discovery: There was no sound coming from the rear speakers. I had given myself over to half a speaker set.

A check at Logitech's support site revealed the answer. The control module (it's far too big to call a "remote") contains a Dolby Digital and DTS decoder. When used with an Audigy 2, you must disable the Audigy's onboard decoding. You can't decode a decoded signal. Then you have to run either a coax or optical cable from the sound card to the back of the control module. I installed an optical cable and darn near fell out of my chair. When ancient writers struggled to convey the divinely perfect "music of the heavenly spheres," this is what they must have meant. The complete effect of Dolby Digital surround on a near-field, perfect speaker set, such as the Z-680, defies description.

Let me qualify that: The Z-680 is a mammoth 505W RMS system (1,000W total power). The 188W subwoofer uses an 8-inch driver with a 3-inch, U-shaped port tube for superior resonance. A formidable heatsink adorns the sub's rear panel to keep the internal magnets cooler and decrease electrical resistance. As with great subs, I noticed almost no difference in sound when I moved or rotated the unit. Excellent bass is omnipresent.

Logitech Z-680

The 62W-per-channel satellites and 67W center are crystalline and flawless. Whereas sets such as Altec's 5100 or the Philips AF 610 can sound shrill with the treble turned up, the Z-680 sounds pure. Only at maximum treble do they sound a tad too bright.

Speaking of maximums, this set can crank out 114dB, to which I came nowhere near during testing. However,

CPU Ranking: 0 = Absolutely Worthless 2.5 = Absolutely Average 5 = Absolutely Perfect

more than any other set, the entire sonic range stayed clear from the quietest whisper and until my ears started to hurt from the extreme volume.

Cosmetically, Logitech comes off well enough. You won't find any chrome trim or other cheap, distracting features. If you care to risk a little dust, the protective screens pull away easily and reveal very smart, almost industrial-looking cones. The center speaker is a bit large, which wouldn't be a problem if its stand didn't force the unit to fire up at a slight angle. On a desk, this is perfect for firing into your face. On a monitor, though, the sound buzzes high over your head.

I'm less crazy about the control module. On one hand, having Dolby Digital, DTS, and Dolby Pro Logic II decoding independent of the sound adapter is a huge plus for those shackled with integrated motherboard audio. Like Klipsch's, the module includes headphone and line-in jacks. The two-line, blue-backlit LCD display is an excellent touch, but I found the five buttons awkward to manage. If the module can inform you that there's no optical input present, it should be smart enough to simply select the input that's present. The module should also be half its present size, and I wouldn't mind a USB connection that lets you fine-tune the options from a System Tray-based applet. Furthermore, the wireless remote, while effective, feels flimsy.

These are cosmetic issues, which I care as much about as the set being THX-certified. (Interestingly, Klipsch's earlier ProMedia models were sanctioned by THX while the 5.1 Ultra isn't. The only party that seems to have lost anything in that move is Lucasfilm.) The Z-680 will rock any PC system, but the set really belongs in a living room with a 50-inch plasma screen to match its own grandeur. If you're an audiophile, save your lunch money and buy this system.

MidiLand MX-5

Being the "value" item in any performance product roundup is a tough position to be in. Inevitably, the low-price leader comes off as a would-be contender never able to measure up. So I will start off by saying that I originally requested

MidiLand MX-5

MidiLand's 8200 v2.0 system, which is the company's DDS/DTS home theater flagship and is now bumped into MidiLand's gaming products group. MidiLand instead wanted to send its new seven-piece MX-5. The 8200 looks like so many black cubes, while the MX-5 has a much sleeker, hi-tech image. The svelte, black-and-silver design punctuated by mirrored neodynium drivers is striking, and they feel weighty and solid, as high-quality speakers should.

In fact, clarity is this set's chief failing. Pink Floyd's "Money" sounded much like it did when I saw the band play from nosebleed seats, and that's not a compliment.

However, there's still that $150 price, a blatant appeal to the mid-range enthusiast who might be drawn in by the high-end cosmetics. Does the MX-5 deliver high-end sound for a bargain? Unfortunately, no. For $150 speakers, they're reasonably good, but compared to the Logitech and Klipsch titans in this roundup, the MX-5 comes across as hollow and floundering.

The best part of this package is the 40W, 5.25-inch subwoofer. With a wood enclosure and side tube, the sub reaches down to 40Hz, which is decent, if not impressive. Bass stays clear up until just shy of maximum volume, where a bit of muddiness creeps in. The lows are solid but not in your face; they were most impressive in the "Episode I" pod race, but their lack of clarity was most telling in the "U-571" depth-charging scene. Those explosions should, as Matthew McConaughey's character points out, snap your spine. Instead, they come off as just a succession of "thuds."

In fact, clarity is this set's chief failing. Pink Floyd's "Money" sounded much like it did when I saw the band play from nosebleed seats, and that's not a compliment. Like most speakers, the satellites and center cover up to 20KHz, but they fail to sparkle in the highs, and the mid-ranges feel hollow. "The Matrix's" shooting spree and the surround tracks on my "Last Waltz" DVD should dazzle with surround elements, but I could hardly distinguish the difference between true Dolby Digital and the simulated SRS in M-Audio's Revolution card.

Moreover, with a SNR of 80dB, it's no wonder MidiLand pulls its power punches here. Each satellite is 10W and the sub only 40W. I could crank the system up to maximum volume and still be left wanting for more.

If you only have $150 to spend on speakers, the MX-5s will serve well enough in a casual office setting, especially with that handy wired remote, but they're no theater or gaming solution. CPU

by William Van Winkle

(As we went to press, we received the M-Audio LX set. To read that review and our review of the Philips Acoustic Fusion 610 set, you can go to www.cpumag.com/cpunov03/speakers.)

CPU Ranking: 0 = Absolutely Worthless 2.5 = Absolutely Average 5 = Absolutely Perfect

Athlon 64 FX-51
$733
AMD
(800) 538-8450
www.amd.com

AMD Athlon 64 FX-51

Finally, the wait is over: It's Hammer time! The K8 variety, not the baggy trousers sort, that is. It's been in AMD's cards for a while now, delayed multiple times, and even released first in the server/workstation market in Opteron form, but what enthusiasts have really been waiting for is the desktop version of AMD64. Luckily, I've spent the best part of a month playing with AMD's top-dog 64-bit Athlon 64 FX-51 processor with a NVIDIA nForce3 Pro/150 chipset and stacking it up against Intel's Pentium 4 3.2GHz (sorry, no Prescott yet). Here's how things break down.

The Specs

Starting with the hardware itself, the Athlon 64 FX-51 is based upon AMD's own SOI (silicon-on-insulator) 0.13-micron process and packs in a massive 105.9 million transistors, which is almost double the 54.3 million of the Athlon XP that came before. Next year, AMD is hoping to move to a smaller, 90-nanometer process with a 120mm die size shrink. Most of the 193mm die is taken up by the stonking 1,024KB of L2 cache and the 64KB L1 instruction cache and 64KB data cache, which obviously helps during large workloads. The Athlon XP topped out at 2.2GHz for the 3200+, and even though the FX-51 on show here is also clocked at what might seem a lowly 2.2GHz, it doesn't need to be up at Intel's 3+GHz levels due to better IPC (instructions per clock) efficiency, lower memory latency, and large cache. The FX-51 we have runs/operates at 1.55 volts, surprisingly low power consumption. AMD also threw in SSE2 support, which boosts performance over the old Athlon XP right out of the box for SSE2-optimized apps.

The CPU now looks much like a Pentium 4 with a heat-spreader, but turn the chip on its backside, and you'll notice a massive number of pins. Don't bother counting them, but as an FYI, the FX-51 comes in socket form with 940 pins. Non-FX socket Athlon 64s will carry 754 pins. Motherboard headaches? Maybe a few. . . .

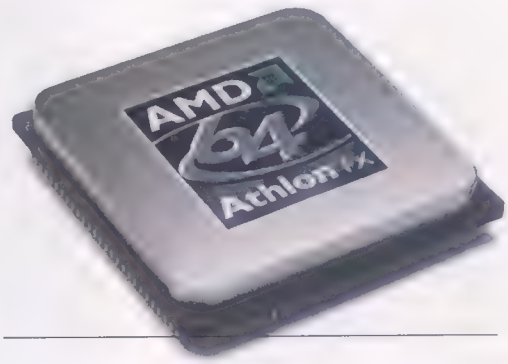
Perhaps the most important change is that for K8-based processors, AMD decided to integrate a scalable (with the CPU's frequency) DDR memory controller (supporting dual DDR400/333/266) on to the CPU die itself. This not only reduces DRAM latency but also speeds up memory access, which is just what the doctor ordered for those memory-hungry apps/games—very cool indeed. As AMD's Computation Products Group CTO and VP Fred Weber puts it, "By bringing [the] memory controller onto the processor, we've greatly reduced the latency to main memory. In reality, these very fast processors spend a lot of time sitting at red lights, burning gas, and not really accomplishing anything because they're waiting for data to come in from the DRAM, from memory." (You can see the full interview with Fred Weber at www.cpumag.com/cpunov03/weber.)

Then the FX-51's 128-bit memory interface serves up a down-and-dirty 6.4GBps worth of memory bandwidth (the lesser Athlon 64s will use a 64-bit interface and only be capable of 3.2GBps), which is pretty groovy, as it's got plenty of headroom. Not incidentally, the 940-pin FX-51 version does require you to use the more expensive registered memory, whereas Athlon 64s are fine with unbuffered DIMMS.

Instead of a traditional FSB, AMD's bidirectional, full-duplex HyperTransport system bus technology is used in a 1600MHz link (800MHz x2 with DDR) x 16-bit link (2 bytes) x 2 (because it's bidirectional) for a total of 6.4GBps of available system bandwidth. That number matches the 6.4GBps capability of the FX-51 processor. How synchronous is that? Perfect, and in fact, in line with the current top P4's 6.4GBps specs. The HyperTransport bus really does tackle traditional I/O bottlenecks for single-processor systems and, unlike Opteron multiprocessor systems, the FX-51 only requires a single HyperTransport link.

32-bits In A 64-bit World

64-bits and large memory configurations are great for workstation/server apps such as content creation or database management that move huge amounts of data around, but they also come in handy for apps needing to process data 64 bits at a time, such as the big math needed for encryption and key generation. Where we humble power users might benefit from these features first is more along the lines of photo, audio, and video processing and video codecs that can take advantage of more and larger registers, a total of 16 64-bit integer registers and 16 128-bit SSE registers, along with 64-bit virtual and 52-bit physical addressing.



For now, however, gamers require fantastic gaming performance in today's games run in 32-bit mode. So think of the Athlon 64 as an extension of 32-bit

CPU Ranking: 0 = Absolutely Worthless 2.5 = Absolutely Average 5 = Absolutely Perfect

x86 architecture rather than a replacement for it. As you can see from the benchmarks, AMD's claim of "industry-leading 32-bit performance" stands true here, but just in case you happen to be a game developer, Athlon 64 processors are already primed for 64-bit operation. We've been messing with a 64-bit Beta version of Windows XP (due out next year), but some Linux-based and content creation tools are already available to early hardcore 64-bit adopters. The ability to run perfectly in 32-bit mode now and 64-bit mode later (as well as 32-bit support within a 64-bit OS) means AMD covers all of its bases, and very well too. In the meantime, keep on enjoying 32-bit games as Epic's Tim Sweeney keeps hashing out his 64-bit Unreal engine, which he promises will have greater levels of realism thanks to 64-bit.

A Bit On nForce3

Because AMD's Athlon 64 sports the memory controller on the CPU itself, the old "northbridge" is out of NVIDIA's hands. nForce3 Pro is a single-chip solution (MCP), which not only lowers the cost but also reduces latency and sports a high-bandwidth internal bus architecture. The chipset supports dual-channel DDR400 memory; an Integrated SATA/IDE RAID controller with support for RAID 0, 1, 0+1; and JBOD configurations. ATA-133 is also supported in case you need it. Back once again for nForce3 is AMD's HyperTransport, six USB 2.0 ports, integrated AC'97 with SPDIF sound, and LAN (10/100 for the moment). The board we used was a very stable ASUS SK8A, but expect MSI, Gigabyte, and the usual motley crew to come out with boards not only based upon NF3 but also VIA- and SiS-based chipsets.

But before you get carried away with yourself, this new performance champ FX-51 will not be cheap, so bring yourself back down to earth with the $733 price tag. But who said being an early technology adopter and gamer was easy? Being targeted at workstation users and high-end gamers, expect it to be available in limited quantities, initially in the tens of thousands. So you may have to look hard. Of course the other question on everyone's lips is just how well the more mainstream and widely available Athlon 64 3200+ processors, priced at $417 and clocked at 2GHz, will perform. We'll answer that one another time, but for now, AMD is back with a bang, at least until Intel releases Prescott. ▲

by Alex "Sharky" Ross

	AMD Athlon 64 FX-51	Intel P4 3.2GHz (800MHz FSB)	AMD Athlon XP 3200+ (Barton)
3DMark 2001SE			
640 x 480 x 16	22826	19042	17774
3DMark03 1,024 x 768 x 32			
Overall Score	6081	6047	5918
CPU score	865	707	676
CPU Test 1	96.6	77fps	74.8fps
CPU Test 2	15.3	12.8fps	12.1fps
Quake III Normal			
640 x 480	474.9	436.6	359.7
1,024 x 768	436.2	411.2	347.7
Unreal Tournament 2003 1,024 x 768 x 32			
Flyby	230.2	192.1	189.5
Botmatch	96	73.9	76
Jedi Knight II			
1,024 x 768 x 32	217.7	189.1	179.9
Comanche 4			
1,024 x 768 x 32	72.76	64.91	56.11
PCMark 2002			
CPU	7156	7422	6824
Memory	11559	9579	6284
WinAce			
	3.3MBps	2.7MBps	2.83MBps
Lame MP3 Encoder			
	3.3MBps	3.45MBps	3.28MBps
View Perf 7.1			
3DS Max	12.12	15.18	15.86
Design Review	46.68	60.7	63.38
Data Explorer	55.58	46.81	67.04
Lightscape	12.9	13.85	15.25
Pro/Engineer	12.55	16.65	15.43
Unigraphics	8.83	8.846	7.39
SiSoft Sandra 2003			
CPU Arithmetic			
Dhrystone ALU	6342	7371	6048
Whetstone FPU	3052	2570	3029
CPU Multi-Media			
Integer	10754	14953	11876
Floating Point	12726	23740	13952
Memory Bandwidth			
RAM Int Buffered	3400MBps	4370MBps	2882MBps
RAM Float Buffered	3555MBps	4354MBps	2713MBps

CPU Ranking: 0 = Absolutely Worthless 2.5 = Absolutely Average 5 = Absolutely Perfect

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June '03

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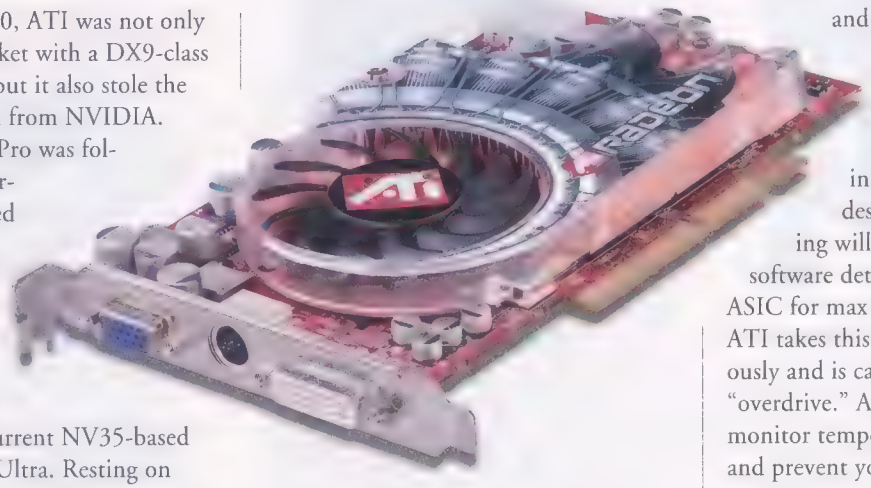
CPU First Look PREVIEW

New ATI Radeon Technology

9800 Pro XT (R360) 9600 Pro XT (RV360)

With the R300, ATI was not only first to market with a DX9-class 3D graphics chip, but it also stole the performance crown from NVIDIA. The Radeon 9700 Pro was followed by the higher-clocked, R350-based 9800 Pro, which not only took out NVIDIA's much-delayed NV30 competitor but still holds the lead over the current NV35-based GeForce FX 5900 Ultra. Resting on one's laurels has historically proven to be a dodgy strategy (just ask former 3dfx folks), and it's been six months since the last release.



So the question we've all been asking is: What's next? Entirely based upon the same eight-pixel pipeline architecture that's come before, ATI's new R360 architecture will power the follow-up product, the Radeon 9800 Pro XT. During a lunchtime meet, we were given a behind-closed-doors look at ATI's offices in Silicon Valley. Very tasty it was, too. Let me explain. . . .

R360. The main course, the 9800 Pro XT, will be a 0.15-micron part clocked at 412MHz, backed up with a side of high-speed 365MHz (effectively 730MHz) DDR memory served on that same 256-bit memory architecture that's been tried, tested, and proven before on R300. And ATI's not serving up French pint-sized portions of it, either: Boards will ship with 256MB of DDR memory, which should keep memory bandwidth-hungry DX9 titles fully fed. So the chef's (or ATI's engineers, rather) secret recipe here is more of the same but in bigger portions and, of course, clocked significantly higher.

But you can't just jack up clock speeds willy-nilly. ATI had to make some major improvements in terms of thermal cooling. The company engineered an elaborate copper heatsink, which almost covers the entire PCB, and huge (and I do mean huge) fan combo. In 2D situations, the fan will slow down dynamically, and then in 3D gaming environments when you really need more power, Scotty, it will speed up.

Before you cry foul, this cooling solution looks nothing like NVIDIA's NV30 HSF conundrum. There's no loud intake/exhaust; the solution is instead low profile and was actually quiet to boot: During the entire 1.5-hour meeting, the card was running a 3D HSL pixel-shader demo in the background. To prove it was still a single AGP slot design, the board was running in a Shuttle PC minibox, which NV30 and NV35 cannot do.

Clock-throttling, which both ATI and NVIDIA have done before successfully on the mobile side, will be applied with "Dynamic Modes" to be served up in future Catalyst drivers for dessert. Dynamic overclocking will be possible, thanks to the software determining the optimal ASIC for max performance. Apparently, ATI takes this overclocking thing seriously and is calling this new feature "overdrive." And yes, the software does monitor temperature to keep things safe and prevent you from overcooking.

DX9 gaming. Decisions ATI made a very long time ago are now really going to begin to bear fruit with DX9-developed titles actually coming out to a store shelf near you. "Doing more textures and doing more arithmetic on those textures: that's what engineers think that artists want," said ATI's Daniel Tanorvsky.

Going with 8-pixel pipelines instead of four and the ability to do texture look-ups in parallel with floating-point operations in a single clock will really show dividends in DX9-class games, according to ATI. Obviously the killer app will be Valve's visually stunning (especially those outdoor scenes) Half-Life 2, which you'll be happy to know comes in full-version form as part of the 9800 Pro XT's bundle.

It's not just about HL2 though; this holiday season you will, for the first

time, see games that were developed way back on ATI's DX9 hardware that show the fruits of longer programmable shader programs, per-pixel lighting and shadows, and post-processing effects. The level of accuracy and efficiency required to make things look as the developer intended in DX9 titles may well show up looking/running spiffier on ATI's hardware, and this is not something NVIDIA can change with drivers, either. The fixed-point advantage of NVIDIA isn't really DX9 applicable in the real world. NVIDIA's precision is more DX8-like, and image quality could turn out to be a little worse that way. NVIDIA needs to change hardware here.

In the meantime, developers will actually have to do some extra "reworking/optimizing" to make games such as HL2 and Doom 3 look and run better on NVIDIA hardware. In reference to Half-Life 2, Daniel Tanorvsky also added, "NVIDIA has forced developers to make decisions which should be transparent to developers. Fruits of the seed ATI planted were planted with R300. We made some tough decisions to deliver DX9 parts before they were actually effective, but now with HL2, things are coming together."

As usual, new high-end 3D cards do not come cheap, but you already know that, and it probably won't surprise you to know the introductory price for the 9800 Pro XT will be $499 when it is introduced in late October or early November of this year.

9800 Pro and 9700 Pro units are still being sold, and their prices will obviously be driven down in order to make way for the 9800 Pro XT. Because DX9 is here to stay for a while, it might be safe to speculate that an All-In-Wonder version of the 9800 Pro XT could be in the cards.

We don't have any benchmarks to show you yet this month, but we've been promised a test sample in time for next month's issue, so stay tuned. ATI did show us its in-house results, which were promising, but 9700 Pro and 9800 Pro users needn't worry or throw their cards on the compost heap—you're still very well taken care of.

RV360. At the same R360 briefing, ATI also gave us a sneak peak at its Radeon 9600 Pro follow-up mainstream product powered by the RV360, the 9600 Pro XT. Again, this isn't some huge architectural change but rather more of the same but clocked higher. This will be a very important product for ATI being targeted at the mainstream. ATI wants, no, let me rephrase that, *needs* to own the rights to the best-performing $200 3D card. This is where the money is really made, and challenging NVIDIA's as-yet-unannounced 5600 Ultra board will be a tough task.

Thanks to the low k-enhanced 0.13-micron process, which minimizes interference and allows for higher clock speeds, the RV360 chip will be clocked at a Carl Lewis-like 500+MHz. (The final speed is rumored to be 520MHz.)

ATI claims that games coming out will be more "engine bound" than "memory bound," which I'm not sure I agree with, but we'll see. Will it be enough for Enhanced 6XAA and 16XAF? Either way, the sweet spot for the 9600 Pro XT will be 1,280 x 1,024 x 32, and ATI says the on-board 128MB frame buffer will take care of things more than adequately. Incidentally, the DDR memory will be clocked at 600+MHz (300x2, effectively).

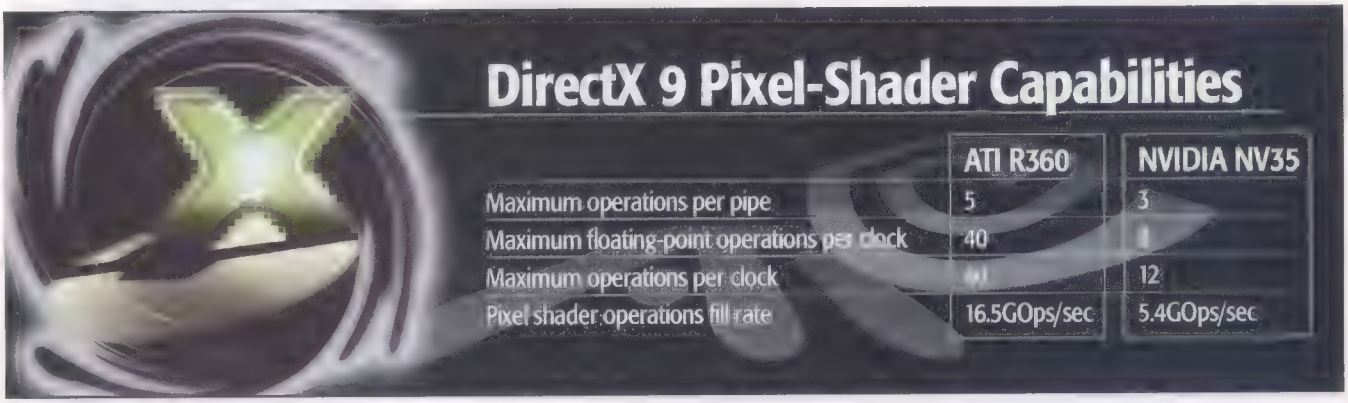
Eight-pixel pipelines won't make the grade at $200; that's still reserved for the top-dog 9800 Pro XT. But for $199, a good performing, quad-pixel pipeline architecture and dual-vertex engine will likely suffice for SmoothVision 2.1, SmartShader 2.0 and Hyper Z III+ under DX9 situations.

Cooling will take place with a low-profile HSF combination, and 9600 Pro XT boards have no secondary power requirements, either (thanks in part to the lower power consumption possible with the low k process). The new Catalyst drivers and encompassed Dynamic Overclocking will also work with the 9600 Pro XT.

Although we were not able to do any benchmarks yet, ATI showed us some of its in-house test results (so obviously take these with a pinch of salt) that compared NVIDIA 5600 Ultra to the 9600 Pro XT. Splinter Cell and AquaMark 3 were roughly 50% faster on the 9600 Pro XT at 1,280 x 1,024.

Just like its bigger XT brother, the 9600 Pro XT will ship with a full copy of Half-Life 2 in October. We can hardly wait . . . erm, for the 9600 Pro XT, that is. ▲

by Alex "Sharky" Ross



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Here's a stylish, Mac-friendly external DVD+RW from Plextor. It's the PX-504UF, the FireWire and USB 2.0 external version of the company's PX-504A burner. This 3.75-pound drive is fairly bulky, but it looks nice and packs a few extras.

Specs-wise, this Plextor is a 4X/2.4X/12X DVD+RW and a 16X/10X/40X CD-RW. Its silver and transparent case has rounded sides, but you can situate the unit on its side with an included plastic stand. If you're more of a flat drive person, you can use the stand for your corn on the cob or tacos.

The PX-504UF offers rear RCA left and right audio outputs, plus a front headphone jack and volume control. The drive comes with both USB 2.0 and FireWire cables and includes an uplink port for daisy-chaining other FireWire devices to it. You switch between FireWire and USB modes with a rear toggle that's close to the on/off switch.

This Plextor wrote a 4GB DVD+R in a respectable 15:52 (minutes:seconds; Verbatim 4X) and a DVD+RW in 23:11 (Verbatim 2.4X). It kicked out a 700MB CD-R in 5:35 (TDK 16X) and a 639MB CD-RW in 7:49 (Verbatim at 10X). Read rates peaked at around 10.75X and averaged 8.32X. Our test system had a 2.67GHz, 533MHz FSB P4; an Intel D845GEBV2 mainboard; 384MB of DDR SDRAM; and WinXP Pro SP1. In sum, this drive isn't at the cutting edge of performance, but it's not far away, either.

Besides the omnipresent black disc tray, Plextor drives are famous for their unlimited toll-free phone tech support and one-year warranties. This one comes with Roxio Easy CD Creator 5 DVD Builder, PhotoSuite 5 SE, CyberLink PowerDVD, and a 30-day trial of Dantz Retrospect. There's even Roxio Toast 5 Lite for Mac OS 9.1 and later. ▲

by Marty Sems

SmartDisk FlashTrax

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Although 5-megapixel cameras are getting cheaper every day, the flash cards that store those big image files are still pretty expensive. Because of this, the FlashTrax from SmartDisk is one of your flash card's best friends.

This do-everything 30GB drive is equipped with a 3.5-inch color monitor, USB 2.0 port, and most importantly, a slot to accommodate your CompactFlash cards. After transferring your photos, you can browse pictures quickly and easily using the device's thumbnail mode, or if you want to wait a little longer, full-screen images. Connect the FlashTrax to a television with the included AV cable to see even bigger versions of your images, and you can also play back 30fps video clips.

Although it's optimized for multimedia file manipulation, the FlashTrax makes it easy to cut and paste, delete, and move files. Renaming files and folders isn't as tedious as it first sounds (you have to use a tiny, PDA-like on-screen keyboard) because the four-way controller works so intuitively with the graphical interface. File transfers are quick, too; it took less than five minutes to copy nearly 300MB of images to the drive.

Though not as slick as iPod's MP3 control system, the FlashTrax handles audio files with ease. When you select a folder filled with tracks, you'll see a Media Player-like interface that lets you control playback. You can also fold down the monitor to conserve battery power and then use the side-mounted controls for playback and volume control. Disconnect the headphones and you've still got sound because there's a tiny external speaker that provides decent audio.

Battery power comes courtesy of a light Li-Ion pack that plays about three hours of MP3s. Connected to a drive that's well constructed and dependable, this is my favorite dressed-up hard drive yet. ▲

by Nathan Chandler

CPU Ranking: 0 = Absolutely Worthless 2.5 = Absolutely Average 5 = Absolutely Perfect

Biostar iDEQ 200T

iDEQ 200T
$299
Biostar
(626) 581-1055
www.biostar.com.tw

Biostar is back with a Springdale-based encore for Intel fans, the 200T, and it was everything we hoped for plus a little more. For benchmark scores, you should tune into our online review at www.cpumag.com/cpunov03/biostar to see that the 200T not only outdoes Biostar's 200N, but it even squeezes past the mighty Monarch Hornet we reviewed in our recent SFF roundup (August *CPU* page17 and September *CPU* page 20). The 200T isn't just about speed; the box supports one 5.25-inch and two 3.5-inch drives, and thanks to the Intel ICH5R southbridge, you could install a two-drive SATA RAID. Biostar's P4TBA motherboard features other gems, too, such as a wireless LAN slot, FireWire, C-Media audio, 10/100 Ethernet, and SPDIF in and out ports.

All of the things that made the first iDEQ great are still here. Biostar's innovative copper heatsink and ventilation design remain unchanged. (My sample unit came with the BIOS set to run all fans at full speed, which was rather loud. Biostar promises that subsequent production units will default to running in Smart mode, which is whisper quiet.) The chassis exterior is all screwless, and all three panels remove independently. My favorite touch remains the way Biostar runs cabling through interior chassis passages and drops connectors near where they will be needed. As with several other SFFs, it seems that the one connection Biostar neglected was the Molex power connector at the end of the AGP card. Rather than wrestle the case and start snipping ties, I just used a splitter to extend the cable length.

Unlike most SFF PCs, Biostar opts to put its AGP slot closer to the CPU than its one PCI slot. Although this does allow for two-slot cards such as NVIDIA's 5800 and 5900 designs, the GPU's heatsink blows directly onto the back of the PCI card. In my tests, this actually blew right on the back of a Sound Blaster's audio chip. Biostar says it hasn't heard of any thermal problems in this regard, but be careful.

With its attractive, sliding front panel to hide unmatching drive faces, three-drive capacity, sweet looks, and excellent performance, the 200T solidifies Biostar's rightful place in the world of top-shelf SFF vendors. ▲

by William Van Winkle

Minolta DiMAGE F300

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The Minolta DiMAGE F300 is one of the lowest-priced 5-megapixel cameras available. Furthermore, I found it online for about $200 less than the MSRP. The camera also has an extremely compact design and 3X optical zoom. The F300 sounds like the perfect camera, but it isn't without some faults.

I'll get some of those faults out of the way first. The camera takes a bit longer than I'd like for the lens to extend and the LCD to turn on (about five seconds). Also, when you point at something black or dark, the LCD gets "staticky" (similar to bad TV reception).

In addition, there's no clear menu option to switch between TIFF and JPEG modes. You have to know that the Super Fine compression setting captures TIFFs, while the higher- compression settings capture JPEGs.

Most of my test shots turned out well, despite much barrel distortion at the wide-angle position. Pictures taken under fluorescent lighting or under an incandescent floodlight had accurate colors and were well focused. The F300's macro mode automatically zooms in to the telephoto position and locks in place. This limits shooting flexibility, but it also ensures that you'll shoot at the ideal lens position for this camera's macro mode. Outdoor macro close-ups were vibrant and well focused. Other outdoor shots were also sharp and properly exposed.

This camera has no AF-assist lamp, so you need to provide adequate lighting. The F300's greatest weakness, though, is high levels of noise. The F300's noise-reduction feature helps some but not enough.

This camera has several compelling features, including Subject-Tracking Autofocus, which focuses on a moving subject, and a status screen that displays current settings and the battery's level.

The F300 is a reasonably priced 5-megapixel camera that produces high-quality images. You can find 4-megapixel cameras that perform better, but if it's 5 megapixels you seek, Minolta's DiMAGE F300 is a solid choice. ▲

by Kylee Dickey

CPU Ranking: 0 = Absolutely Worthless 2.5 = Absolutely Average 5 = Absolutely Perfect

Linksys WPC55AG vs. SMC SMC2336W-AG

Of course, if you're going to be smart and have a dualmode router so any client can connect to your WLAN, it makes just as much sense to have a dual mode PC Card so your notebook can connect to any access point you happen to come across.

Because *CPU* only had two dualband routers at its disposal during this writing (the Linksys and D-Link models reviewed on page 29), I selected the D-Link DI-774 for its stronger performance and repositioned it high up on a shelf to be as far away as possible from potentially interfering devices. Each card ran on a Compaq Evo N400c notebook in four locations: about 4 feet from the router in the same room, directly under the router on the next floor down, at the opposite end of the house on the lower floor, and from one block away while maintaining line-of-sight contact with the router.

Linksys WPC55AG

Once again, Linksys breaks its own quality rules with its dualband products, this time by having a card that performs well enough but has extremely problematic setup and configuration. I found that the WPC55AG's drivers installed without a hitch, but the client application refused to install, either by autorunning from the CD or by manually running the setup files buried within a fresh software download. After 20 minutes on a late-night call with the company (gotta love that 24/7 live support!), it turns out that the Wireless Zero Configuration Properties under Control Panel, Administrative Tools, Services needed to have its Startup type set from Automatic to Disabled. This turns off the built-in WLAN tools in Windows XP. With this done, the client installed and I (foolishly in retrospect) ended the support call.

To make a long story short, I was unable to use the Linksys client to switch from 2.4GHz to 5GHz bands and had to re-enable the Windows service and use that to switch modes. At this point, I could only use Linksys' application to monitor signal quality on the two bands.

On the other hand, I was impressed with the card's tenacity. In the one-block-away test, the card held onto a tenuous 10% connection and wouldn't let go until the transfer session was complete, whereupon it dropped the connection. In close proximity or separated by one wall/floor, the card did an excellent job. Even with multiple barriers, it still turned in a decent transfer time despite meager signal strength. So if you can get the WPC55AG configured to taste, you won't be disappointed by the results. It's just that getting there can be a pain.

SMC SMC2336W-AG

The best thing I can say about this card is that I never called SMC tech support. Of course, having logged in almost an hour with dualband support already, I knew what I was in for. To SMC's credit, the PC Card's adapter client software installed flawlessly. I double-clicked, the program came up, and I started to rejoice until I noticed that no wireless networks were available through it. In the end, I had to re-enable Windows' Zero Configuration tool, get the connections operational through that, bring up SMC's software, and then turn off Zero Config, whereupon SMC was able to manage its card and switch between bands just fine.

I really have a hard time explaining the 2336W's results. Signal strength is identical for both bands in each location. However, in the one-block-away test, SMC blows away every other nonboosted adapter I've tried by averaging 50% signal strength in 802.11a and scoring that miraculous 1:48 download time. But then in the 802.11g band, which is *supposed* to be better than in a, the signal is completely dead. Go figure.

SMC costs the same, installs the same, and also has 24/7 toll-free support. But in the end, given that I had equivalent configuration problems with both brands, yet SMC lags behind its competitor on every indoor test, I'll hand the win on this one to Linksys. Both products, though, could use some improvement. ▲

SMC2336W-AG
$99.99
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(800) 762-4968
www.smc.com

WPC55AG
$99.99
Linksys
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(949) 261-1288
www.linksys.com

by William Van Winkle

See www.cpumag.com/cpunov03/pccards for our test scores.

CPU Ranking: 0 = Absolutely Worthless 2.5 = Absolutely Average 5 = Absolutely Perfect

D-Link AirXpert DI-774 vs. Linksys WRT55AG

Why settle for one wireless LAN protocol when you can have all three? Chances are your existing wireless adapters, bridges, and access points are based on Wi-Fi (802.11b). But store shelves are filling up with the 2.4GHz Wi-Fi replacement, the 54Mbps 802.11g, and many offices over the past two years adopted the 5GHz 802.11a. With a trimode, dualband (2.4GHz and 5GHz) router, you don't need to worry about which client protocol is connecting to your LAN.

But is dualmode everything it promises? To find out, we landed the Linksys WRT55AG and D-Link's AirXpert DI-774. In previous reviews I've done around my home, I've been able to connect up to two blocks away from a Linksys BEFW11S4 router provided that line of sight back to the router was maintained. I'd hoped for even better results from these higher-end units. Alas, it seems with improved speed comes a cost in connection quality.

AirXpert DI-774
$99
D-Link
(877) 453-5465
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www.dlink.com

WRT55AG
$249.99
Linksys
(800) 546-5797
(949) 261-1288
www.linksys.com

Linksys WRT55AG

Setup on this unit couldn't have been easier. Because Linksys routers and access points are made to stack one on top of another, I merely slapped the dualband model on top of my existing Wi-Fi router, moved all the cables from the old box to the new one (noting along the way, though, that the WRT55AG lacks an uplink port), and stood back as it ran through its start-up diagnostics.

Then came the installation CD's setup wizard, complete with IP and DHCP settings, as well as SSID and channel selection. (You actually end up with two of these, one for each radio band.) If you want, the browser-based options menus within the router let you disable ID broadcasting, turn on security measures, and so on. All standard stuff so far—and then the trouble started.

The worst was the unit renewing its DHCP addresses every few minutes. I would watch the wireless connection get worse and worse, then drop entirely until it renewed a bit later. Firmware update 1.04 fixes this, but there are still substantial problems, including being forced to broadcast your 802.11a SSID and poor overall signal. (Readers can see examples of this in the "Router Results" chart at www.cpumag.com/cpunov03/routers). When testing in the 2.4GHz band, I used channel 11 to avoid conflict with nearby cordless phones, which use channels 2 through 9. Still, despite the fact that 802.11g is widely known to have better transmission and reception capability than 802.11a, the strength of both were terrible, and g was even worse than a at close range. Sometimes, reboots and router resets helped; sometimes they didn't.

I remain a fan of Linksys in general, but all the great setup routines in the world can't compensate for abysmal performance. This unit needs to be retired—quickly.

D-Link AirXpert DI-774

Router setup is down to a science these days, and installing and configuring the DI-774 is no harder than the WRT55AG. Truthfully, I think D-Link's iteration is a bit clearer than Linksys', as is the LED display on the router's front face. (Although I do love all those extra Linksys lights in a dark room.) D-Link walks you through SSID and channel selection, WEP setup, and connection testing, although there is plenty more you can fine-tune beyond the wizard. Also note that WPA security is available via a recent firmware update—kudos to D-Link for rushing that out.

The DI-774 did not suffer from address or security setting problems. All in all, it's a fine router. The only significant problem is that it is still underpowered. There are two versions of this router: the twin-antennae version A I received and the single, fatter antenna on version B; perhaps the B router is stronger. I hope so. Signal strength should not be dropping under 80% when sitting 3 feet from the router with all power saving disabled.

I also noticed odd occasions when the client NETGEAR card reported an extremely stable signal strength and then held it there for a long period. This did not occur with the Linksys router, and I'm not sure why it only happens rarely. For example, when testing 802.11g performance at the opposite end of the house on the ground floor (the router was upstairs), signal strength stayed locked at 42%. When I went back and retested an hour later, it fluctuated as usual.

Like Linksys, for indoor use in fairly close proximity to the router, this isn't a bad unit. If you can wait and see if subsequent models improve the performance, great. If not, perhaps other vendors will deliver better results. Still, in this head to head, D-Link comes out on top. ▲

by William Van Winkle

CPU Ranking: 0 = Absolutely Worthless 2.5 = Absolutely Average 5 = Absolutely Perfect

Tadpole SPARC*LE*

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Hundreds of thousands of techies, from chip designers to system administrators, toil by day on Solaris-based workstations made by Sun Microsystems. Then they go home and check their email on a Windows notebook. While traveling, they are unable to continue their programming or design work because their notebook runs the wrong operating system. That's a lot of power users who aren't being productive.

Targeting that market, Tadpole Computer, a maker of rugged portable gear in Cupertino, Calif., has created the SPARC*LE* notebook computer, a 64-bit, Solaris-based notebook. The machine aims to replace those unnecessary Windows notebooks, as well as more specialized Solaris luggables that cost upward of $7,000.

Design. The SPARC*LE* has the look of sleek notebooks such as the Sony VAIO, but it is 100% binary compatible with 13,000 Solaris applications. It can run clones of Windows-based Office productivity software so that users will never miss their PowerPoint slides. In contrast to Windows, it may be years before the operating system crashes, says Mark Johnston, CEO of Tadpole, based on the reliability of Solaris.

Who cares about running Solaris? If you just want to escape Windows, Linux is likely to be an easier path. But the aforementioned chip designers, and anyone else who has to run Solaris, are the target users here; so are developers who want to test a program in isolation on a development machine but don't want to risk bringing down an entire network. Then there are power Solaris users who just want to run a mission-critical application on the road, Johnston says.

The SPARC*LE* runs Solaris 9.0, with an option to use 8.0. The version introduced in May uses version 6.0 of Sun's StarOffice suite, which functionally clones Microsoft's Office functions. Future versions will use StarOffice 7.0, which adds some ease-of-use features such as saving in Adobe formats.

The SPARC*LE* has the look of sleek notebooks such as the Sony VAIO, but it is 100% binary compatible with 13,000 Solaris applications.

Booting up the SPARC*LE* seems little different than starting up a Windows machine. It flashes a lot of text before the user but loads the GNOME desktop user interface, which resembles Windows. As with Windows, you have to configure the Mozilla (Netscape) browser for broadband Ethernet access. That's where you really have to know the ins and outs of Unix commands because configuring for network access isn't automatic.

From there it's simple to create your own word-processing, spreadsheet, or PowerPoint clone documents. You can use the Solaris programs to open and read email files with Windows attachments for Excel, Word, and PowerPoint files. There are a handful of games, such as the Windows Minesweeper clone Gnome Mines, but there is no authorized DVD playback function. Anyone who wants that function would have to download at her own risk.

Specifications. The notebook weighs in at a hefty 7 pounds, but it's considerably lighter than other secure Solaris machines the military uses. The $2,995 version comes with a 440MHz UltraSPARC IIe processor, a 40GB hard drive, a 24X CD-ROM drive, and 256MB of DRAM. For $3,995, you get a 500MHz UltraSPARC IIe and double the DRAM at 512MB. The next level up will cost you $4,995, but you'll get a 500MHz UltraSparc IIe, a 60GB hard drive, a DVD/CD-RW drive, and 1GB of DRAM. The $5,995 version has a 650MHz UltraSPARC IIi, a 60GB hard drive, DVD/CD-RW, and 1GB of DRAM.

Your display options include a 14-inch XGA (1,024 x 768) or a 15-inch SXGA+ display (1,400 x 1,050). Every SPARC*LE* configuration has a Wi-Fi networking option, three USB 2.0 ports, built-in speakers, one serial port, two PS2 connections, a parallel connector, headphone jacks, and a 10/100 Ethernet port. Battery life should last approximately three hours. Tadpole says the closest performance comparison to the SPARC*LE* is the Sun Blade 150 workstation. For floating point, a 650MHz UltraSparc IIi is roughly equivalent to a 1.5GHz to 2GHz Pentium 4, says Bruce Borden, chief technology officer at Tadpole.

Tadpole expects to come up with a Linux-based notebook, as well, based on Sun Microsystems' Madhatter Linux desktop software, which will be supported by software vendors such as Macromedia, Adobe, and Real Networks. Tadpole expects to launch this Linux-based notebook by November. For those who aren't Solaris freaks and simply just want to escape Windows, the Linux machine should offer the easier learning curve. ▲

by Dean Takahashi

CPU Ranking: 0 = Absolutely Worthless 2.5 = Absolutely Average 5 = Absolutely Perfect

by Anand Lal Shimpi

AMD's Long-Awaited Winner Is Here

Anand Lal Shimpi has turned a fledgling personal page on GeoCities.com into one of the world's most visited and trusted PC hardware sites. Anand started his site in 1997 at just 14 years old and has since been featured in USA Today, *CBS'* 48 Hours *and* Fortune. *His site—www.anandtech.com—receives more than 55 million page views and is read by more than 2 million readers per month.*

When the Athlon XP was released, I did my first story for *CPU* mag on it. Now with the release of the Athlon 64, I'm doing the very same, so here's your one-page guide to the Athlon 64.

AMD released two versions of the Athlon 64: the regular Athlon 64 and the Athlon 64 FX. The Athlon 64 is the same 754-pin CPU based on the ClawHammer K8 core that we've been talking about for a while. It features a 1MB on-die L2 cache and officially supports memory speeds up to DDR333, and it can be used with all regular, unbuffered DDR memory (the same stuff you use on your Athlon XPs and Pentium 4s). The Athlon 64 only features a single HyperTransport link and thus can only be used in single processor configurations. AMD is launching the Athlon 64 at a 2.0GHz clock speed, which corresponds to a model rating of 3200+. Note that the way AMD came up with this 3200+ rating is much different than how they came up with the Athlon XP 3200+ rating, as they are using updated benchmarks with a much more conservative way of calculating performance ratings; this translates into the Athlon 64 3200+ being faster than the Athlon XP 3200+ in all aspects, despite the two processors carrying the same rating. For more information on the architecture, you're going to have to read my article on AnandTech.

The Athlon 64 3200+ ends up being good competition for the 3.2GHz Pentium 4 . . .

Because of pressure by OEMs for a dual-channel solution, as well as a desire to distance itself from the model rating system that has come under severe fire from the review community, AMD added another part onto its Athlon 64 line: the Athlon 64 FX. This chip is basically an Opteron with DDR400 support that is being introduced at 2.20GHz. AMD is marketing the Athlon 64 FX as an "enthusiast" chip and thus isn't branding it with any model numbers, but rather a series number that is arbitrarily chosen. The first Athlon 64 FX will be the 51, and it runs at 2.20GHz. The 51 has no meaning other than it will be slower than the next FX, the 53. Since the FX is basically an Opteron, it uses the same 940-pin Socket and will work in all Opteron motherboards with a BIOS update. The chip officially supports DDR400; however, since it is based off the Opteron (read: is an Opteron), it only supports registered/buffered DIMMs, which aren't very common in the enthusiast community. AMD will tell you that support for unbuffered DIMMs isn't necessary at this point because in order to put as much memory as enthusiasts would like to put in FX systems, you will need to resort to DIMM sizes that are currently only offered in registered modules. While there is some truth to that, the fact of the matter is that if AMD wanted to enable unbuffered support, they would have to re-do the packaging of the FX, meaning that it would no longer be as simple as hand-picking Opteron processors that could hit 2.20GHz and DDR400 and calling them Athlon 64 FXs. That said, AMD will release a version of the Athlon 64 FX with support for unbuffered memory in a matter of months.

So how do these solutions perform? In gaming, office, and some workstation applications (e.g. software development), the Athlon 64 takes the title of fastest desktop processor. It falls behind the Pentium 4 in areas such as content creation, 3D rendering, and media encoding—all strong points of the Pentium 4's architecture. The FX offers a mild performance gain over the regular Athlon 64, but it costs almost twice as much. As I mentioned awhile back, motherboards are able to run memory at DDR400 speeds even though the Athlon 64 only officially supports DDR333. The Athlon 64 3200+ ends up being good competition for the 3.2GHz Pentium 4, so AMD is doing just fine on the performance front. It will have a bit to prove on the upgrade path and platform stability fronts, and those will take time to mature; but if they do, AMD does have a winner on its hands. ■

Send your feedback to Anand@cpumag.com.

by Alex "Sharky" Ross

Requiem For A Cheat

Disrupting Reuters' newswire with a cheery Christmas greeting at age six, Alex "Sharky" Ross became an avid computer user/abuser, eventually founding popular hardware testing/review Web site SharkyExtreme.com. Exposing shoddy manufacturing practices and rubbish-spouting marketing weasels while championing innovative products, illuminating new technology, and pioneering real-world testing methods was just a front for playing with the best toys. The site acquired, he left in 2001. A London native and London School of Economics graduate, Alex currently swims in Silicon Valley.

The situation has gotten out of hand, and someone needed to step forward. Valve Software was, somewhat reluctantly it seems, first in line, but every entity along the hardware designer/game developer/technical journalist/retailer/end-user food chain is affected by shady benchmark "optimizations."

Gabe Newell and the guys at Valve have taken a strong position against the growing practice of hardware guys creating special "optimized" drivers that speed up benchmark performance on specific applications (in this case, Half-Life 2) through incorrect rendering. Although Valve voiced its position at an ATI event, and the main object of scrutiny was NVIDIA, the strong point made was more general and ultimately more important than one GPU company or another dressing up benchmarks. NVIDIA is a huge player in Valve's market, and no game developer takes it on without good reason, some soul searching, and at least tacit consent from its business people. This is not fodder for soap operas; this is bread and butter and creative integrity for high-end, leading-edge, and very expensive development. It is also about credible journalism. When enthusiast hardware journalists prattle on about fabulous hardware performance that is based on cooked benchmarks, we become part of a marketing campaign based on misinformation. So how did we get here?

Shady benchmark 'optimizations'

Back when 3dfx (actually, 3Dfx then) had us all by the pocketbook, we didn't think about things like benchmark "cheating." As it was still a guaranteed publisher repellant for any developer to announce a hardware-only game, everything also had to run in software, and gamers were not exactly astonished to see the degradation in image quality and/or frame rate when switching from hardware to software rendering. It was just the technology and market reality.

When NVIDIA (nVidia then) introduced the RIVA 128, the first 3D card to give Voodoo a run for everyone's money, developers were just happy to have another card for which to optimize and another opportunity to get a lucrative OEM bundling deal. It didn't really matter that, for games optimized on Voodoo hardware, sometimes the RIVA 128 rendering looked rather unpleasant. It was accelerated 3D, and that was the important bit.

As soon as you have two of something in the market, it is quite natural to want to compare them in some reliably objective way. Thus benchmarking of graphics hardware by Internet journalists, who were mostly just game/hardware enthusiasts with business cards, was spawned. As time went by, people began to test with VSYNC manually disabled, even though WHQL drivers outlaw that practice, because it provided a more accurate picture of potential graphics performance to consumers when evaluating a product purchase. (And it gave higher numbers: 100+fps sounds so much sexier when you've just parted with 200 quid, even for a journo.) When somebody (Matrox?) introduced this capability in its drivers, it was only called cheating by the competition up until the point they had all implemented the option. Then it became an industry norm, even if it did mess with Microsoft's WHQL intensions.

As 3D APIs matured, their version numbers and specs began to mean something beyond a checkmark on the box. Image quality, special features, and/or performance became additional criteria for evaluating company X's implementation of a new API or a particular feature against company Y's—once there was actual software available to take advantage of the feature. Hardware demos and synthetic benchmarks helped fill in the time gap somewhat, but there were still surprises when real games arrived. Hardware engineering teams have taken different paths to reach API compliance: some better than others, some worse. Some so much worse, their companies don't exist anymore. Developers tend to be an innovative and tricky lot. Many a hardware engineer has learned a thing or three (or lost his lunch) after seeing how his hardware is really used.

Thus we've all come to understand that "DX8-compatible" or even "DX8-compliant" means different things to different hardware. Just because a given feature is supported doesn't mean that if a developer uses it, performance will come in at playable rates. GeForce XYZ (you can look it up) "supported" something like eight movable light sources, which looked really cool (even in slow motion), but no developer was silly enough to put it in a game back then. It was a visual delight, a preview of coming attractions, not really a workable feature. It probably did sell some hardware, though. The tricky bit is when software arrives and one company's implementation is pretty and fast and another's is just pretty. More on that next month. ■

Optimize me at sharky@cpumag.com.

by Kyle Bennett

Be Afraid

Kyle Bennett is editor-in-chief of HardOCP.com (hardocp.com), one of the largest and most outspoken PC-enthusiast sites on the Web. HardOCP.com is geared toward users with a passion for PCs and those who want to get cutting-edge performance from their systems. Beware, though, Kyle is known for his strong opinions and stating them in a no-nonsense manner while delivering some of the most in-depth reviews and PC hardware news on the 'Net.

I'd like to chat a bit about the Athlon 64 and Athlon 64 FX. Wow, it seems we've been talking about the desktop version of the AMD Hammer CPU for years. By my sarcastic estimations, AMD has spent more money marketing the Athlon 64 than on actual CPU R&D. But that's neither here nor there, as the CPU has finally launched. Actually, as I'm writing this, it's 11 days before the official launch, but we've already had lots of hands on.

We have been playing with the Athlon 64 3200+ and Athlon 64 FX-51 for weeks now. The A64 3200+ is a 754-pin Hammer core CPU that supports a single channel of DDR333 memory and runs at an even 2GHz (10x200). The FX-51 is a 940-pin CPU that supports a dual-channel DDR400 memory configuration and runs at 2.2GHz (11x200). The A64 FX will require registered DDR400 DIMMs to run, while the A64 won't need buffered memories. The A64 still carries a rating to identify it, while the A64 FX has graduated to an ambiguous model number. It really seems to mean nothing. We've been told the model number will scale, much the same way an Oldsmobile Delta 98 is a "better" car than the 88. You get the picture.

AMD is damned if it does and damned if it doesn't.

In short, both CPUs have shown stellar performance. They're awesome. The A64 FX has been posting record benchmark scores, and the vanilla A64 hasn't been very far behind. I don't see any enthusiast buying one of these rigs and being unhappy with the performance. We've yet to see the full overclocking picture, however. OCing the CPUs we have has been a bit disappointing, as we've gotten little over 200MHz on the A64, and the A64 FX has done well to break the 150MHz OC mark. It's early on, though, so this may very well change as the CPU matures. There do seem to be other stumbling blocks that could trip up the A64, though.

We're hearing some scary things out of Taiwan, including that the A64 isn't going to be available in quantities that come close to satisfying the market. It has been repeatedly rumored to us that less than 100K desktop Hammer CPUs will be available for sale through the Christmas buying season worldwide. If true, that will mean very few CPUs will be available to enthusiasts, many who badly want to get their hands on the technology. It would seem that after waiting so long, AMD would want to hit the ground running with huge inventories, but if the grapevine is correct, that won't be the case.

It also looks as if there will be a socket change for the Athlon 64 FX in Q1. Without getting into the meat and potatoes here due to limited space, the A64 FX is nothing more than a renamed Opteron that doesn't have official dual-CPU support (not sure if unofficial support is there or not yet), but it does have official DDR400 support. Still, the A64 FX requires registered DDR400 DIMMs, which even 11 days before the launch are hard to find (and will be expensive). Around February 2004, we will likely see the A64 FX shed one pin, becoming a Socket 939-pin part, while at the same time dropping the requirement for registered DIMM. That will certainly make it a bit more desirable to enthusiasts.

These CPUs will probably be out of the price range of what most of us consider acceptable. The A64 looks like it will land in the $450 range, while we have seen estimates for the FX model swinging between $600 and $800. There's certainly a market for the CPUs, but I don't think AMD's core base of customers is going to buy at those prices.

AMD is damned if it does and damned if it doesn't. It has to launch Athlon 64 now. AMD's stock price can't weather another major bump in the desktop Hammer timeline. Be afraid. Be very afraid that Intel is about to lose its only competition. Without AMD it looks like we might have to go back to paying ridiculous amounts of money for CPUs. Then again, it may be that way even with AMD.

I hope I am wrong about the speculations written here. I would much rather be telling a rosy AMD story this month, but right now there's just not one to be found. ■

Talk with Kyle at kyle@cpumag.com.

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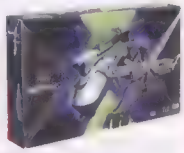

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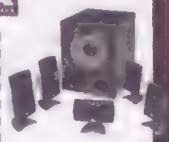

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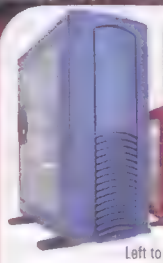

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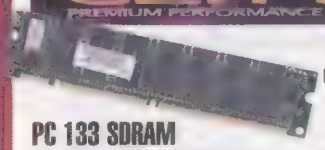

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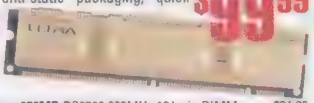

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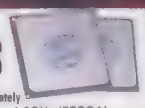

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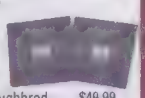

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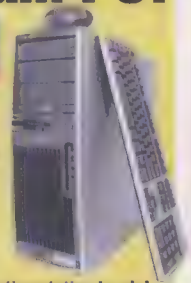

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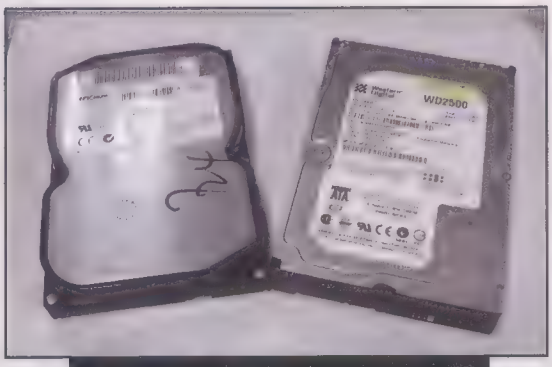
Swappin' Parts

CINDI Gets A Drive-In Closet

Each month in "Swappin' Parts," a Computer Power User *writer upgrades one out-of-date component in our test machine, CINDI (Computer In Need of Drastic Improvement). CINDI has had a busy summer making room for a new motherboard, CPU, RAM, and Radeon 9800 Pro. Unfortunately, all this great silicon has been hobbled by a slow 10GB Samsung hard drive that was rebranded by a company we've never heard of. Join us as we put the byte on CINDI—a terabyte, actually.*

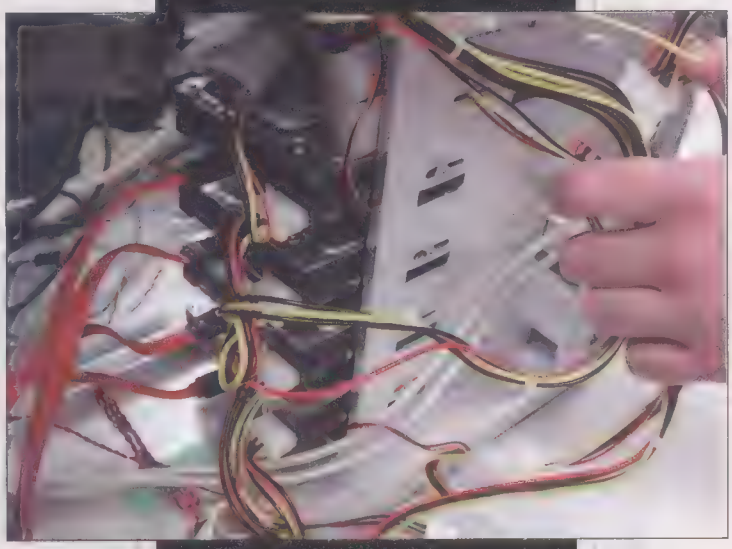


Here's CINDI's old TriGem, née Samsung 10GB drive next to one of the 250GB Western Digital WD2500JDs (right). You can't see it here, but the 10GB is trembling.

Holy cow. Who's the fox? Can this truly be the frumpety-frump we lovingly dubbed CINDI all those months ago? It is as if halfway through "My Big Fat Greek Wedding," the lead role switched to Sandra Bullock.

The last time I spent with our digital debutante was way back in the April issue (page 38) when I fitted her with DVD-RW and CD-RW drives, courtesy of Pioneer and Plextor. Even then she was getting to be a looker with her tasteful Cooler Master case. Like an endearing chipped tooth, though, that derelict floppy drive I noticed then is still front and center. Call it a beauty mark, I guess.

Unfortunately, even after all of CINDI's upgrades and improvements, she's still a bit slow. Oh, she can encode MP3s and whip through Unreal Tournament 2K3 like nobody's business, but it doesn't take much face-to-face interaction with CINDI to sense the hesitation below the surface. Methinks she has one or two demons yet to exorcise.



Pull aside the tangled skeins of wires in CINDI's case and you'll spy the four new drives installed there. This is what a terabyte looks like.

The puckish imp in this case is CINDI's lackadaisical 10GB hard drive, made by Samsung and rebranded by TriGem. Samsung's drive lineup got a major boost in quality and reliability a few years ago, but unfortunately, this SpinPoint SV1022D probably predated that renaissance a bit. This 5,400rpm, ATA/66 veteran with a 512KB buffer is way too small and slow for CINDI's tastes these days, but I have to admit that it's still chugging along as it should. But no longer.

There are few upgrades you can make to a PC for a hundredfold improvement, but I did it to CINDI. She wanted a full terabyte—that's 1,000GB—of fast storage space, preferably with the recent Serial ATA 150MBps interface. Sure, 1TB is an arbitrary amount that's much more than almost any desktop PC really needs, but I don't care. With CINDI's newfound comeliness, a certain persuasiveness has emerged. I feel strangely compelled to give her what she wants. I know I'm being manipulated, but if it means I can bask in her presence a mite longer, so be it.

In any case, we let CINDI catch an extra moon of beauty sleep in October. Actually, we wanted to do this upgrade a month ago, but the counters that be let us know that there weren't enough beans in the jar, or something like that. Apparently the Insidious One, Samit, was too busy practicing his imitations of the GTA: Vice City voice actors to mention a $1,300 expense ahead of time.

She Drives Me Crazy

First things first: I counted CINDI's drive bays to make sure she had room for four 250GB hard drives before I committed to the project. Three bays wouldn't have cut it, as the biggest drives at this

writing are 300GB Maxtors. Three 300GBs would have fallen short of the 1TB brass ring, and the cost of four 300GBs probably would have caused some sort of accounting meltdown. Plus, 1.2TB just isn't as much fun to say as "a terabyte, bay-by." It's the same reason why you refer to the 1.133GHz Pentium III in your Ogg Vorbis jukebox as "a gig and change."

CINDI did, indeed, have four free 3.5-inch drive bays, once I relocated her existing 10GB drive to a flat perch above the hated floppy. My next concern was whether CINDI's power supply had enough moxie to power four hard drives, two optical drives, a Radeon 9800 Pro, and all her other stuff. The power supply is a 350W Enermax EG365P-VE with 17A on the 12V rail, and it came through just fine.

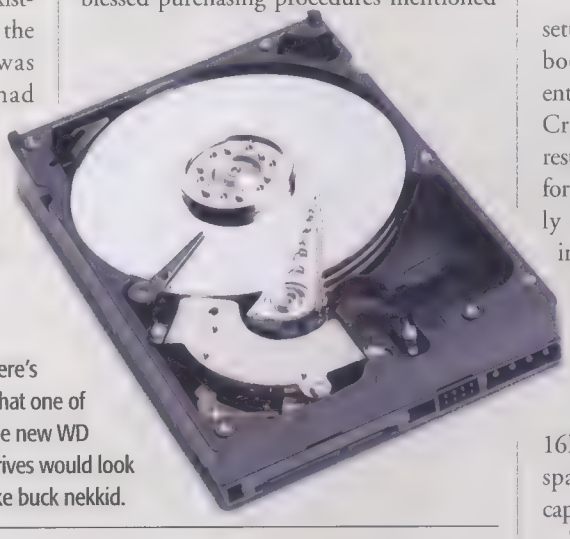
Next, I had to decide if SATA was really better than EIDE for CINDI's purposes. With multiple, identical drives it was a perfect opportunity to build CINDI a RAID. Her Gigabyte GA-8KNXP motherboard has integrated support for SATA RAID 0 (data striped [split among drives] for speed) and RAID 1 (mirrored [copied among drives] for redundancy). However, for EIDE drives, the Gigabyte supports RAIDs 0, 1, 0+1 (two sets of striped pairs, one mirroring the other), and JBOD (Just a Bunch O' Disks pretending to be one drive).

I put the question to Samit, who put down his Cheetos long enough to decide to stick with SATA. Besides a possible tiny speed advantage over EIDE, SATA has the cachet of new technology, of which CINDI is the poster child. Besides, we can always upgrade CINDI with a four-port adapter card that supports more RAID configurations later on, if we want. I was hoping that Promise's new FastTrak S150 SX4 RAID 5 card ($199; www.promise.com) would be part of this month's upgrade, but our testing revealed that this card really prefers 66MHz PCI 2.2 slots, which CINDI doesn't have.

Ultimately, I ordered four Western Digital WD2500JD 250GB drives, which have 8MB caches and 7,200rpm spindle speeds. The WD2500JDs also have reinforced SATA headers to reduce the risk of breakage, plus Molex and SATA power connectors. Actually, Maxtor's DiamondMax Plus 9 250GB SATA proved to have slightly better top read speeds in our latest tests, but the four WDs were already ordered. Ah, me.

RAIDing CINDI

Speaking of my order, thanks to the blessed purchasing procedures mentioned above, CINDI's shiny new SATA drives arrived just two days before deadline. D'oh. That wasn't a whole lot of time to spend with CINDI, but because she was a perfect lady throughout the upgrade, everything went very smoothly.



Here's what one of the new WD drives would look like buck nekkid.

CINDI's Gigabyte mainboard uses a Silicon Image Sil3112 controller for its two SATA headers with RAID 0 and 1, and the Intel ICH5R southbridge to run the other two SATA headers. Unlike EIDE, SATA supports only one drive per header, so my four new drives maxed out CINDI's SATA potential.

Gigabyte threw in a supplemental printed manual for setting up the Sil3112 RAID. At the manual's suggestion, I made sure the Sil3112's RAID driver was installed in the existing WinXP Pro installation on the 10GB drive. The manual said I would need to format and partition the RAID in Windows, so I left the 10GB connected as the boot drive throughout the procedure.

Next, I shut CINDI down and installed all four drives in her bays. I only connected power and data cables to the top two for the moment, using the Sil3112 headers on the motherboard. I started CINDI again, pressing DELETE to enter her BIOS setup. In the Integrated Peripherals section, I adjusted the following settings: On-Chip SATA to Auto; SATA RAID Function to Enabled; Onboard HW SATA to Enabled; and Serial ATA Function to RAID.

I saved my changes and exited the BIOS setup, which restarted CINDI. When her boot routine indicated, I pressed F4 to enter the RAID setup utility. Here, I chose Create RAID. To get a speedier "after" result from CINDI's benchmarks, I opted for a fast RAID 0 (or maybe more accurately "AID 0," as there's no redundancy involved? Tomâto, tomato) over a safer RAID 1 and selected the Striped option. I accepted the automatic configuration, which designated the drives as primary and secondary and set a "chunk size" (allocation unit size) of 16KB. RAID 0 doesn't spend any storage space on ECC or backup data, so total capacity was about 476GB.

The RAID was made but not formatted or partitioned, yet. I left the RAID utility and booted WinXP. In the Control Panel's Administrative Tools, I selected Computer Management, Storage, and Disk Management. This gave me a graphical representation of CINDI's hard drives, their partitions, and their statuses. Here, I right-clicked the new RAID's unallocated space and chose New Partition. Using the wizard, I made a 20GB NTFS partition that I labeled "RAID OS," which I intended for WinXP Pro later on.

Back in Disk Management, I right-clicked the remaining space in the RAID and selected New Partition again. This time, I made an extended partition out of the 446GB or so left. Finally, I right-clicked the new partition once more and chose New Logical Drive. I made two logical drives (which behave like partitions and have their own drive letters) of roughly 225GB each and labeled them RAID APPS and RAID DATA. Here, I paused to reboot and run some benchmarks (see the results in the accompanying "Before & After" chart).

My original plan was to set up the other two WDs as regular drives, but something caught my eye in one of the Gigabyte motherboard's many users manuals. It mentioned SATA RAID using the Intel ICH5R southbridge, not the SiI3112. Was it possible that CINDI could have two RAIDs? Yes, she could, but the Intel RAID setup was limited to RAID 0 only, and it wasn't documented very well. Still, I muddled through that RAID's setup. Here's how:

After I connected the two remaining 250GB drives to the Intel headers and rebooted, WinXP couldn't find the RAID controller driver it wanted. I clicked Cancel and stuck in the Gigabyte motherboard's installation CD. It suggested I install Intel Application Accelerator RAID Edition, and I did. I rebooted, and WinXP found its RAID driver.

I found Intel Application Accelerator RAID Edition in the Start menu and launched it. I then right-clicked RAID Volumes and selected Create Manually. With RAID 0 my only option, I named the new 465GB volume RAID B and left it at the strongly recommended 128KB strip size. (Blocks that large rub me the wrong way, so I may change this and repartition later.) Finally, I exited IAARE and entered WinXP's Disk Management, whereupon I formatted RAID B as one big, fast partition. Oh, yeah.

I didn't have time to install a fresh copy of WinXP Pro on CINDI's new drives, but I did make a semihopeful attempt to restore a drive image to the SiI3112 RAID. I expected snags from driver issues when Windows tried to boot, but they started much earlier than that. PowerQuest Drive Image 7's bootable CD is very, very particular about loading SCSI or RAID drivers, even from a medium as ordinary as the functional floppy drive I borrowed for an A: drive. In the end, I ran out of time to pursue the drive image idea, but it's just as well. I think I'd rather install the OS and drivers cleanly, if for no other reason than to get rid of all the utilities and bloatware currently choking CINDI's startup list and System Tray.

Setting up the new drives as two RAID 0 sets was more a proof of concept than the way I would prefer. Assuming CINDI keeps using her onboard SATA RAID instead of a four-port RAID card, I would reconfigure the SiI3112 striped RAID 0 as a mirrored RAID 1 and use it strictly for personal data storage. I would then repartition the Intel RAID 0 pair into two drive letters, one for the OS and one for apps and games. That way, CINDI could enjoy exceptional OS and app speed and mirrored data without the need for an additional PCI RAID card, although her total storage space would fall to about 750GB because of the redundancy of the RAID 1.

Bucs Trounce Bears

The real fun in all this was the anticipation of the benchmark results. A RAID 0 looks hot enough compared to a single drive, but stacked against an outmoded 5,400rpm drone, it's more of a slaughter than a contest. Note that the new drives didn't have any data on them as the 10GB Samsung did, and my results are only from the first 20GB partition of the SiI3112 RAID. In other words, this isn't really an apples-to-oranges drive comparison. This is more like Tampa Bay taking a break from the NFL to stomp Baylor, with Bill Cosby providing appropriate commentary.

The numbers are in the chart, but here's the bottom line: The SiI3112 RAID 0 read four times faster than the wee Samsung. (HD Tach couldn't run write tests because of the data on the 10GB drive.) The RAID more than doubled the Samsung's IOps (inputs/outputs per second) in IOMeter and logged six times the speed in Winbench99's tests.

Penultimate Preen & Primp

Even though her final hard drive configuration hasn't been settled yet, CINDI tells me she feels much better now. My knees go all watery when she coos like that. And I think she even winked an LED at me, just me. Hot-cha.

So what's next for CINDI? There's not much left to do, but hopefully it will be something to dress the rat's nest of cables inside her case. Whatever the final chapter holds for our lovely, hairy worm-turned-butterfly, I sincerely hope there's 10 bucks in the budget for a prettier floppy. CPU

by Marty Sems

Before & After

It feels a little like tossing grasshoppers into a spider's web, but here's how the aging Samsung hard drive that was in CINDI stacked up against the first 20GB of the RAID 0 on her Silicon Image SiI3112 controller. The Samsung drive had data on it and the RAID didn't, so this comparison is more for entertainment value than anything else.

	Before Upgrade: Samsung SpinPoint SV1022D EIDE 10GB*	After Upgrade: Western Digital WD2500JD SATA 250GB (x2) RAID 0**
HD Tach 2.61		
Average Reads	19.1MBps	81.9MBps
Max Reads	24.1MBps	95.7MBps
Random Access Time	15.2ms	14.3ms
Winbench99		
Business Disk	2,970KBps	16,900KBps
High-End Disk	6,080KBps	39,500KBps
IOMeter 2003.05.10		
File Server*	77.05IOps	175.87IOps
Web Server**	96.41IOps	223.63IOps

*One user, 16 outstanding I/Os
**Four users, 64 total outstanding I/Os


AMD
My adrenaline fix
isn't what it used to be.
Double the dose.
AMD me.
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Introducing the AMD Athlon™ 64 FX processor. Take your system to extremes.
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The FAST & The Not So Furious

The FAST Protocol Should Boost Internet Speeds For Scientists

An item's name doesn't always adequately describe it. Consider the classic contradiction of jumbo shrimp. Then there's the term "fast food." Let's face it: Sometimes it's fast and sometimes it resembles food, but it rarely fits into both categories.

If you're looking for something that lives up to its name, try the new Internet protocol, the FAST protocol. How fast is the FAST protocol? In the time it takes to say the protocol's actual, full name aloud—Fast Active queue management Scalable Transmission Control Protocol—you can send the entire contents of a DVD across the Internet using the FAST protocol. During a FAST protocol demonstration within the past year, using 10 simultaneous flows of data, scientists achieved a speed of 8.609Gbps, or slightly more than 1GBps. (A typical commercial DVD can hold up to 4.7GB of data.)

Although the FAST protocol probably isn't going to change the way you access the Internet any time soon (unless you're a scientist or a university researcher, that is), its capabilities may change the way some industries you deal with regularly, such as the entertainment industry, do business.

The Research

Researchers in Caltech's Networking Lab developed the FAST protocol, building on the idea of creating a theoretical foundation of the Internet. Such theoretical work occurred throughout the 1990s at

The FAST Protocol Experiment

Within the past year, computer scientists at Caltech demonstrated the power of the FAST protocol. Using 10 simultaneous flows of data, the scientists achieved a record speed of 8.609Gbps, or slightly more than 1GBps on a connection between Sunnyvale, Calif., and Geneva, Switzerland. This experiment, which occurred at the SuperComputing Conference in Nov. 2002 in Baltimore, used existing transoceanic and data-transmission lines, making the data speeds even more impressive.

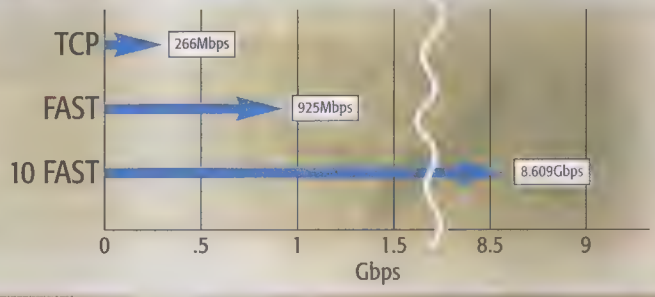
Sunnyvale, Calif.
Data moved from here to Chicago using an OC192 link (up to 10Gbps). This site featured a Cisco GSR 12406 router.

Chicago
Data moved from here to both Baltimore and Geneva. The OC48 DataTAG link (up to 2.5Gbps) connected Chicago with Geneva.

Baltimore
Data from Chicago arrived here on an OC192 link (up to 10Gbps). High-speed Cisco routers received data on the conference floor, measuring transmission speeds.

Geneva
At the final destination of CERN, a Cisco 7606 router received the data. Some servers here used 10Gb Ethernet cards, which Intel had just developed.

Using TCP, researchers measured the average data-transmission speed from Sunnyvale to Geneva at 266Mbps; the measured average speed jumped to 925Mbps using the FAST protocol. For this experiment, researchers combined 10 FAST protocol systems, achieving a nearly tenfold improvement in the data-transmission speed of a single system. The ability to combine more than one FAST protocol system to achieve even greater transmission speeds is one of the most significant advantages the FAST protocol owns over TCP, which cannot combine systems.



Graphics & Design: Jason Codr & Carrie Benes

Is The FAST Protocol Fair?

If you're the kind of person who hates it whenever it seems like the rich are getting richer, you probably aren't going to be too fond of the FAST protocol. After all, who wants faster data transmission rates: you with your 56Kbps dial-up connection or some scientist who already has a 1Mbps high-speed connection?

Although it might not seem fair, in the foreseeable future the FAST protocol will only help extremely fast data transmission speeds become even faster. Why? Because traditional TCP already works quickly enough to maximize the capabilities of consumer-level Internet connections. The bottlenecks that slow transmission speeds in consumer-level Internet connections typically don't involve TCP; instead, they usually involve a piece of hardware, such as the modem or the phone line.

For the same reason, the FAST protocol won't be able to boost the speed of a low-speed network. If the cabling and network cards only support 10Mbps transmission speeds, then the FAST protocol won't be able to offer a speed boost to the network over what traditional TCP can provide.

However, in extremely high-speed connections, TCP itself can become a bottleneck in performance. (Whenever TCP encounters a lost packet, it cuts its transmission speeds in half, preventing it from taking advantage of high-speed, dedicated connections. See the "What Makes FAST Faster" graphic for more information.) In these situations, the FAST protocol can step in to remove the bottleneck caused by the Internet protocol and allow the data transmission to take greater advantage of the maximum possible transmission speed. Researchers have measured high-speed networks running at 25% to 35% of capacity using TCP; the FAST protocol can boost that transmission speed to 95% or more of capacity on the same networks.

Simply put, the FAST protocol cannot solve a hardware problem that's causing the slow data transmission. The FAST protocol can only solve a data-transmission speed problem originating from TCP's infrastructure.

There's one other issue concerning the FAST protocol that may eventually cause some people to call FAST unfair: the question of whether to commercialize the FAST protocol. Caltech owns the intellectual property behind the FAST protocol, and the institution must decide whether to license the technology or give it away free. It appears the institution is leaning toward a mixed-licensing policy that would make the protocol free for research and education and require fee-based licenses for commercial purposes.

institutions such as Cambridge University, Melbourne University, Caltech, UCLA, the University of Illinois, and the University of Massachusetts. Creating a theoretical foundation of the Internet deals with designing ways to use the Internet in a collaborative fashion, giving researchers and scientists better methods for sharing information.

Researchers describe the FAST protocol as "an alternative congestion control algorithm in TCP." Essentially, the FAST protocol forces data packets on the Internet to be sent at speeds approaching the maximum throughput of the transmission pipe. Traditional TCP rarely approaches the maximum potential throughput speeds because of its rules for significantly slowing transmission speeds whenever a lost packet occurs. (See the "What Makes FAST Faster?" graphic for more information.)

The FAST protocol, sometimes called Fast TCP, works best for transferring large amounts of data over high-speed transmission pipes over long distances. FAST protocol researchers expect the transmission speeds to reach 1,000Gbps in the future.

The Possibilities

Two groups who typically don't share many interests—research scientists and the entertainment industry—are sharing an interest in the development of the FAST protocol.

Researchers are excited about the possibility of moving extremely large amounts of data across the Internet in a reasonable amount of time. Some research projects consist of data files of 1TB (about 1,000GB) or more, and it isn't easy to move such amounts of data using today's technologies. Researchers in data-intensive sciences, such as high-energy physics, nuclear physics, astronomy, global weather prediction, medical, and fusion, would benefit most from greatly improved data transmission speeds.

The FAST protocol also offers possibilities for entertainment that have

FAST Protocol Partners

Here are the institutions and organizations that collaborated in the initial FAST protocol demonstration.

Demonstrating Organizations

- Caltech; www.caltech.edu
- SLAC (Stanford Linear Accelerator Center); www.slac.stanford.edu
- CERN (European Organization for Nuclear Research); www.cern.ch

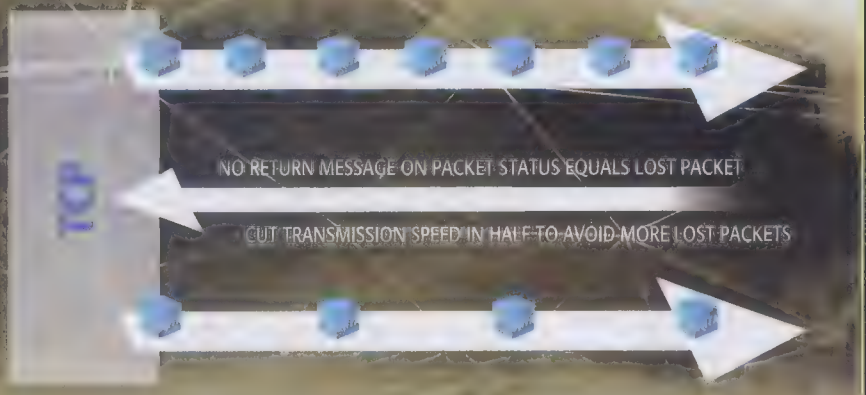
Supporting Partners

- DataTAG; datatag.web.cern.ch/datatag
- StarLight; www.startap.net/starlight
- TeraGrid; www.teragrid.org
- SCinet; scinet.supercomp.org
- Cisco Systems; www.cisco.com
- Level 3; www.level3.com

Major funding for the FAST protocol research comes from:

- NSF (National Science Foundation); www.nsf.gov
- Caltech Lee Center for Advanced Networking; leecenter.caltech.edu
- Army Research Office; www.aro.army.mil
- Air Force Office of Scientific Research; www.afosr.af.mil
- DARPA; www.darpa.mil
- Cisco Systems; www.cisco.com

What Makes FAST Faster?



Traditional TCP was developed in the 1970s, at a time when data moved across the Internet at a few bits per second. Consequently, its inventors didn't build the protocol to handle millions of bits per second, which today's high-speed transmissions demand. As TCP manages the data packets sent across the Internet, it receives messages about whether packets were received OK. (No return message equals a lost packet.) If a packet is lost, TCP cuts the transmission speed in half, attempting to avoid additional lost packets. Because packet losses are inevitable, this procedure greatly hinders data transmission on high-speed lines, not allowing the transmission speed to approach the full capability of the line.

The FAST protocol initially sends data packets in a manner similar to TCP. However, as it begins receiving messages on the status of the transmission line and on the line's traffic, the FAST protocol measures the delays on the line and determines how close to the full capacity of the line it can send data. The FAST protocol then boosts its transmission rate to the highest-possible speed. Although this procedure is going to result in more lost packets than what occurs with TCP, the significant boost in transmission speed with the FAST protocol more than makes up for the time sacrificed in the resending of any lost packets. Determining transmission speed by measuring line congestion instead of by counting lost packets gives FAST Protocol a significant speed advantage. As part of the FAST protocol, the measuring of delays on the line occurs continuously, allowing the FAST protocol to smoothly adjust the transmission speed up and down as the traffic conditions on the line warrant. The FAST protocol is backward-compatible with TCP, allowing it to communicate with networks and hardware still using TCP.

Sources: CalTech, NewScientist.com

media companies excited and nervous at the same time. The FAST protocol could greatly enhance the idea of video-on-demand and pay-per-view movie services. (Reportedly, Disney and Microsoft are consulting with Caltech about merging FAST protocol with on-demand movie services.) However, a high-speed protocol could severely magnify the problem of music and movie piracy as users could download and upload several media files in the time it takes to copy one file today.

Internet2. But for now, those entertainment possibilities are taking a backseat. Researchers are focusing their efforts on using the FAST protocol with Internet2, the partnership between businesses, educational institutions, and the government designed to create the next generation of the Internet. Internet2 will be a high-speed, dedicated network giving researchers nationwide access to leading-edge Internet applications.

Even though the FAST protocol is backward-compatible with TCP and can use the same hardware, researchers don't expect the FAST protocol to make an impact on today's consumer-level Internet infrastructure as dial-up, cable, or DSL, mainly because traditional TCP already comes close to maximizing the Internet pipe for those connection speeds. (See the "Is The FAST Protocol Fair?" sidebar for more information.) Researchers are focusing their time and money regarding the FAST protocol on the areas most likely to see a significant improvement in transmission speeds over TCP.

So, unless you're ready to install a T3 line and join a key research group, you probably won't benefit directly from the FAST protocol anytime soon. But the first time you order a pay-per-view movie and completely download it before you can put the bag of popcorn in the microwave, you'll appreciate the FAST protocol's speed. CPU

by Kyle Schurman

Subscribers can see more on the FAST protocol at www.cpumag.com/cpunov03/fast.

Give *your* car the luxury of satellite navigation.

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RSS

The Holy Grail Of Web Site Sharing

One of the greatest things about the Web is its ability to deliver up-to-the-minute information at all times. Whether it's the latest news headlines or constantly refreshed original site content, the Web can deliver.

So what's responsible for the wealth of information that appear on the Web? How do these sites stay so current? RSS (Rich Site Summary) technology plays a big role. RSS might not be the first technology you think of when discussing the key components of the Web, but it keeps news and information moving at the speed of light . . . or at whatever speed your modem can handle, at least.

RSS Roots

RSS is an XML format that makes it easy to share content, or RSS feeds, between Web sites. All RSS files must conform to the XML 1.0 specification. Some people refer to RSS as Really Simple Syndication or as RDF Site Summary. (See the "Versions Of RSS" chart for more background information on the format.)

Web sites often mark their RSS feeds with icons similar to these three. The red box containing the "XML" text is the most popular icon.

In simple terms, you'll usually find nothing more than a list of items within the RSS feed. RSS is often used for

Versions Of RSS

RSS has developed steadily in the past few years as different organizations have released new versions. RSS actually has developed into two parallel formats, one headed by UserLand Software and one by a noncommercial group called the RSS Working Group. Even though the two formats have different groups supporting them and they aren't compatible with each other, they have similar structures. (The incompatibility issue isn't a problem for most end users because most RSS aggregators and software can handle any version of RSS.)

Version	Year	Developer	Fast Facts
0.90	1999	Netscape*	Netscape developed this version with plans to create a Web portal that distributed news headlines to other Web sites (mainly news sites). Netscape eventually abandoned the RSS project, and this version is no longer in use.
0.91	2000	UserLand	This version of RSS is easy to use and good for basic RSS. Despite version 2.0's availability, .091 remains popular.
0.92	2000	UserLand	This version removes some required subelements; we recommend upgrading to version 2.0.
0.93	2001	UserLand	Version 0.93 allows multiple enclosures in <item> element, but again, we recommend an upgrade to version 2.0.
0.94	2002	UserLand	As this version was never actually deployed, you should use 2.0.
1.0	2000	RSS Working Group	While UserLand was tweaking its RSS version, the RSS Working Group (http://groups.yahoo.com/group/rss-dev) went in another direction, picking up RSS 0.90 and developing version 1.0 in 2000. This put the RSS format into the hands of a noncommercial group for the first time. RSS version 1.0 is designed around the RDF (Resource Description Framework) standard, which makes it incompatible with the UserLand versions.
2.0	2002	UserLand	UserLand wasn't happy about the release of RSS 1.0 because it was developed without input from UserLand, so the company released RSS 2.0 in the fall of 2002, looking to simplify the format's usability even further. 2.0 allows for elements defined in a namespace. It's easy to upgrade from version 0.9x but is not compatible version 1.0

*Developed in conjunction with UserLand (www.userland.com)

Sources: XML.com, UserLand

12 RSS Resources

Several sites use RSS through syndication and aggregation by offering news aggregator software or by providing RSS tools, tutorials, and tips. Some of the top sites are free; others offer fee-based products. Here's a list of a dozen RSS-related sites.

AmphetaDesk

AmphetaDesk is a freeware news aggregator that works under Windows, Macintosh, or Linux. It will collect all of the RSS feeds you want and display them in a Web-page interface.

www.disobey.com/amphetadesk

Bloglet

This site uses RSS feeds to allow Bloglet visitors to subscribe to your blog site and then receive emails whenever your site is updated. Bloglet was experiencing technical problems this summer but seemed to be OK by this fall.

www.bloglet.com

BlogStreet

As part of the BlogStreet site, you can use the RSS Discovery feature, which will search the URL address of any blog and see whether it offers an RSS feed that you then can add to your RSS aggregator. BlogStreet also can help you generate RSS feeds for your blog.

www.blogstreet.com

Fagan Finder

If you're looking for a good, introductory tutorial concerning RSS, this area of the Fagan Finder site will meet your needs.

www.faganfinder.com/search/rss.shtml

fyuze

The fyuze site is a newer news aggregator site that shows a lot of promise. You can search the latest news by keyword, or you can read a virtual daily newspaper that features a news category. Be prepared to work through a few of the site's growing pains, though.

www.fyuze.com

Harvard Law

The creator of RSS and the founder of UserLand, Dave Winer, monitors this outstanding RSS reference blog.

blogs.law.harvard.edu/tech/rss

Meerkat

This free service, which is part of the O'Reilly Network, searches the Web for the latest stories in hundreds of tech-related and business categories. You can search by profile or keyword, too.

www.oreillynet.com/meerkat

Moreover

The company's fee-based products scour the Internet for the latest stories and then tailor those stories for their clients. The company offers no free services.

www.moreover.com

NewsIsFree

The NewsIsFree news aggregator site monitors more than 6,500 sites for the latest headlines. It offers basic services for free and two levels of premium services for subscribers.

www.newsisfree.com

RSS tutorial

This RSS tutorial site is a good intermediate to advanced learning tool and provides some solid links to other helpful RSS-related sites.

www.mnot.net/rss/tutorial

Syndic8

This popular aggregator site offers syndicated news from throughout the Web, and it allows registered users to create profiles for the RSS feeds they want. Users can submit suggestions for new RSS feeds, too.

www.syndic8.com

Utah Library

Libraries were some of the earliest adopters of RSS technology. Considering that, maybe it isn't so surprising that the Utah State Library has one of the best RSS tutorial and resource sites on the Web.

gils.utah.gov/rss

sharing headlines, but it works with almost any type of Web content. RSS gives Webmasters the ability to automate updates for certain aspects of their sites, too. Several big-name Web sites use RSS, including CNN, Forbes, and Motley Fool.

All of the capabilities of RSS make it an important cog in generating traffic to the originating site. For example, you might see a news headline—generated by RSS—on a site that interests you. When you click the headline, you jump to the RSS origination Web site, creating hits and traffic. In a Web world where millions of sites pull Internet users in all directions, any tool that can help your site generate traffic is of vital importance.

RSS In Action

Using RSS on the Web is a relatively recent phenomenon. In the early days of the Web, sites often linked to each other, but they rarely shared data. Obviously, that idea has changed. Sites are using RSS for several reasons.

Blogs. Weblogs, or blogs, have exploded in popularity in the past 12 to 24 months. Blogs let individuals or groups post information on a variety of topics, often relating to their personal experiences and opinions. Bloggers can use RSS when creating a blog to make it easier to update the blog files and let readers know about the changes.

Syndication. Syndication of information is common in TV and newspaper media where the syndication company provides content, usually to dozens of media outlets. For TV networks and newspapers, obtaining syndicated data is usually cheaper and easier than creating original data in-house. In addition, the public finds syndicated data—such as "The Simpsons" TV show or a Dr. Gott newspaper column—more recognizable.

Web sites use syndicated data for the same reasons. It's easier and cheaper to have someone else—preferably a well-known entity—create, organize, and distribute the

Contenders For The RSS Throne

As with any technology, a few competitors to RSS have appeared during the last few years. However, none of them have been able to match the success level of RSS.

Echo

Citing problems with the splintering of the RSS format, a group has started a project to develop a new format, currently called Echo. The group is using an open forum for developing Echo, and it plans to be 100% vendor neutral.

ICE

ICE (Information and Content Exchange) is an XML-based syndication format, similar to RSS. ICE, which was started in 1998 by Vignette and Firefly, has developed slowly. The developers of ICE are aiming it at businesses that want to exchange electronic assets securely or create syndicated publishing networks. ICE is probably the most accomplished challenger to RSS.

NewsML

IPTC (The International Press Telecommunications Council) developed NewsML as a packaging format for news content. Its features are very similar to RSS. NewsML uses NITF (News Industry Text Format) for marking up stories in a manner similar to HTML.

PRISM

PRISM (Publishing Requirements for Industry Standard Metadata) is another packaging format similar to RSS that has yet to gain much acceptance.

data. (It makes more sense for a Webmaster to obtain world news headlines from an expert newsgathering organization, such as CNN or the BBC, rather than to create them himself, for example.) Some syndicated Web data is freely shared among sites; other times, syndicated Web data is purchased from a distributor. By incorporating syndicated data on your site, you'll probably generate more traffic to your site.

Many sites use RSS as a tool for updating news about their sites or products. For example, a site that collects news about a particular product, such as Linux, might automatically grab RSS data from dozens of Linux product Web sites to give visitors a one-stop site to access all of the latest information. Using RSS in this manner is far less time-consuming than having the Webmaster visit Linux-related sites around the Web and manually update his site.

Aggregation. Aggregation relates closely to syndication when discussing RSS. If

In The Know With The RSS Flow

If you want to generate an RSS feed from your Web site, several programs and RSS resources on the Web can help you automate the process. Here's a look at how RSS flows from your site to subscribing sites around the Web.

RSS Example

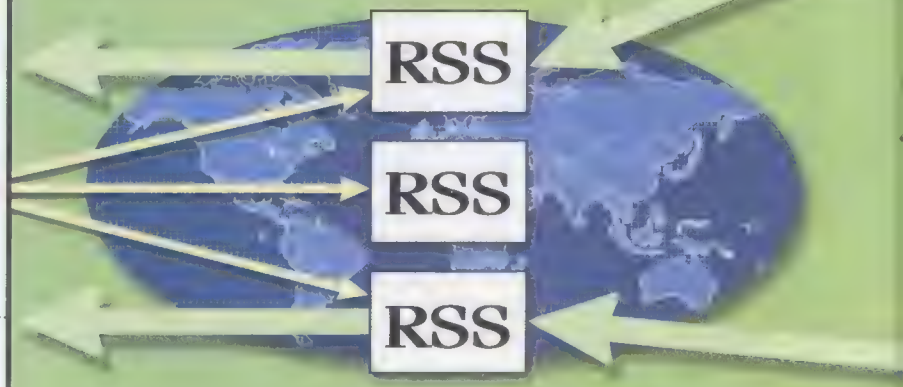
```
<rss version="0.9x">
<channel>
<title>News You Won't Believe</title>
<link>www.nowaynews.com</link>
<language>en-us</language>
<item>
<title>Man Bites Dog</title>
<link>www.nowaynews.com/dog.html</link>
<description>The unbelievable occurred today in
Alaska during a sled-dog race when ... </description>
</item>
</channel>
</rss>
```

News You Won't Believe

Man Bites Dog

The unbelievable occurred today in Alaska during a sled-dog race when . . .

1 You first must create an RSS feed on your Web site. Because RSS requires XML syntax, it can be a little tricky to set up by hand. Several software programs can help you automate the process. The formatting on the left is a simplified example of an RSS file; you will need more HTML and XML elements for your RSS file.



2 With your RSS feed up and running, other Web sites will pull the feed from your site and list the feed's information along with a link to the relevant page on your site. You can contact some of the syndication sites, such as Syndic8.com, to have your RSS feed listed there, too.

a Web site gathers many RSS feeds and then redistributes those feeds, it participates in aggregation.

Different sites use aggregation in different ways. Some sites might collect RSS feeds for the sole purpose of distributing those feeds to its visitors. Other sites might use aggregation to deliver RSS data to other Web sites, helping those sites sort through the RSS data to find exactly the data they want to display.

The aggregator site can incorporate some personalized features, as well, making it easier for you to find the information you want. For example, the aggregator could hide any RSS feeds that you've already visited. It also can sort the RSS feeds into categories, improving the organization of the site.

The term "aggregator" can also refer to software that lets you read RSS files, although these programs are usually called newsreaders, RSS feed readers, or news aggregators. To use a news aggregator, you must tell the software which RSS feeds you'd like to monitor. The news aggregator will then automatically check those RSS feeds, looking for any changes. All of the changes appear inside the news aggregator software window, letting you select the ones you want to read.

Power To The People

One of the best reasons to use RSS is its ability to deliver visitors to your site without an expensive advertising campaign. RSS provides the foundation for more of a grassroots Web campaign: If you have interesting news or commentary on your site, RSS can help you promote it and draw visitors to your site.

For those who just use the Internet and don't need the site-promotion capabilities of RSS, the technology can help them find interesting news through RSS feeds to sites they might not regularly visit.

The strength of the Web is its ability to use links to enhance the usability and organization of the Web as a whole. When a Webmaster finds another site that he deems interesting, he will create a hyperlink to that site on his Web site. Think of RSS as the Holy Grail of hyperlinks. With RSS, the hyperlink now becomes an information link, telling users some useful and updated information about what they'll find when they click through, rather than having them click blindly. Best of all, as a user, you don't have to do anything differently than you'd do with a hyperlink; just find the RSS feeds that interest you and click them. Now that's the kind of quest we can all handle. CPU

by Kyle Schurman

Subscribers can see www.cpumag.com /cpunov03/rss for more on the RSS format.

"Man Bites Dog"

3 A Web user might see your site's headline at another site, and click the RSS feed to jump to your Web site.

4 Other users might subscribe to your Web site's RSS feeds through news aggregator software or through a news aggregator site, both of which automatically alert the users whenever changes are made on your site, or on any other sites to which they've subscribed.

As part of offering an RSS feed, you must keep the feed up to date. Ideally, each time you add new content to your Web site, the RSS feed should reflect the changes, alerting those reading the RSS feed. You can make the changes by hand, or you can have a script file or software program monitor your site for changes and add them automatically to the RSS feed.

SOURCES: USERLAND.COM, WEBMONKEY, FAGAN FINDER

GoToMyPC™

Like being there.

GoToMyPC is the fast, easy and secure way to access your PC from any Web browser in real time.

Fast and instantaneous access to all your emails, files, applications and network resources.

Easy to install (2-minute, one-time setup), manage and work from anywhere.

Secure and powerful end-to-end AES 128-bit encryption to protect all remote connections.

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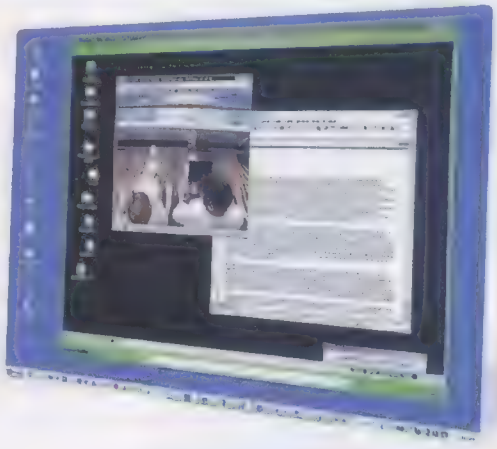

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AMD Today

Spotlight Contents

50 AMD Today & Tomorrow

60 Everyman's Next Mobo?

63 The 64-Bit Question: Are You Ready For The Athlon 64?

From the early '70s until the late '90s, AMD engineers made a pretty successful business out of reverse-engineering Intel's processors to create their own. Until K7, all AMD processors were compatible with Intel, meaning that they used the same chipsets and motherboards. Although AMD's technology was diverging from Intel's for the few preceding generations, with Athlon, the whole game changed. AMD had to build an infrastructure to support the new pathway its engineers were paving, and along the way, it helped alter the course of adoption for several technologies, most notably DDR memory.

Now taking the technology lead by introducing 64-bit computing on the desktop PC, AMD must capitalize on experience gained as a smaller player. Lacking the muscle to mandate change, AMD has had to really listen to the market and understand customer needs.

Who Needs 64-bit Computing?

"The simple answer is everybody needs 64-bit [computing], and the question really is not who needs it, but when do they need it." That's according to the person often

64-Bit Processor Timeline

1991

MIPS: First real 64-bit processor, R4000 RISC, named "Microprocessor of the Year"

1992

DEC: Alpha EV4 64-bit RISC processor (0.75-micron, 150MHz, superscalar and superpipelined, 1.7 million transistors)

SGI: Acquires MIPS Technologies

1993

DEC: Alpha EV4 reaches 200MHz

SGI MIPS: R4400 ships (150MHz)

1994

DEC: Alpha AXP (2X 16KB cache, $1,083), Alpha EV5 1 BIPS

HP & Intel: Announce joint effort that eventually becomes Merced/Itanium

IBM: A10/Cobra & A30/Muckie 64-bit PowerPC

SGI MIPS: R8000 optimized for floating-point operation

1995

DEC: AlphaServer 8400 supports up to 12 EV5s & 14GB memory.

Fujitsu: HAL SPARC64 first 64-bit workstation

Sun: UltraSPARC

& Tomorrow

The Follower Leads

singled out as the originator of AMD64, CTO and VP of AMD's Computation Products Group, Fred Weber. He has led the 64-bit charge, but with a steady eye on immediate customer needs and current market realities. "The 64-bit capability is for some people immediately valuable and for others is valuable later, but first and foremost this is going to be our flagship 32-bit new processor. We've brought a lot of new technology to the machine as part of that."

Are we there yet? Exactly when that 64-bit capability will be fully realized is not entirely in AMD's hands. A finished, stable 64-bit OS is needed for 32-bit software to be ported over to 64-bits. Check out "The 64-Bit Question" on page 63 of this issue for more on the 64-bit application question.

Under The Hood Of Athlon 64

The new technology incorporated into Athlon 64 breaks down roughly into two categories: that which enables 64-bit computing and that which enhances existing 32-bit as well as 64-bit performance. (For more AMD64-related coverage, see our Athlon 64 FX-51 review on page 22.)

32-bit compatibility. In retrospect, AMD's decision to extend the existing 32-bit x86 architecture rather than forge a new pathway to 64-bits was, according to Weber, an obvious choice. "You wake up in the morning and you realize that you need a higher-performance engine in a car; what on earth would make you think that you should get rid of the gas pedal and the brake and the steering wheel while you're at it? All you need is a higher-performance engine." This line of thinking led to an architecture that incorporates the features of a standard 32-bit x86 machine, such as the one the majority of us sit in front of every day. With the ultimate goal of taking every one of us to the 64-bit computing party eventually, AMD felt that Athlon 64 could achieve rapid adoption largely to the extent that it had competitive performance with today's 32-bit applications. That meant using an existing 32-bit OS, such as Window XP, and direct execution, not something filtered through x86 emulation. This decision was counter to what Intel had done with its Itanium implementation of 64-bits for the server/workstation market.

On-chip memory controller. After 64-bits, the sexiest innovation for Athlon 64 has to be the on-chip memory controller with an integrated on-chip northbridge running at full processor speed. Weber claims that bringing the memory controller onto the processor from its usual place on the chipset northbridge results in up to a 30% reduction in latency to main memory. "In a typical, traditional PC, whether an Athlon or an Intel Pentium 4 system, DRAM is on the order of 100 nanoseconds away from the processor. When you're running at multiple GHz, that means that every time you have to wait to get something out of memory, you're waiting for

HP & Intel: Announce IA-64 architecture; say 64-bit will be server-only for five years after shipping

IBM: RS64

Intel: 0.18-micron Merced for 1999 will run all software currently operating on 32-bit Intel processor-based machines.

SGI MIPS: Embedded R4700 named "Microprocessor of the Year,"; ships R12K, cancels H1 & H2 cores, and will adopt IA-64

1996 1997

DEC: EV5 500MHz 2 BIPS peak execution

Microsoft: Promises 64-bit Windows NT for Intel's Merced launch

Motorola: PowerPC 620 processor

Nintendo: Nintendo64 game system with MIPS R4300 processor

SGI MIPS: R10000 (R10K) premiers out-of-order execution & multiple FPU

1998

Compaq: Acquires DEC, announces Compaq Alpha EV6

Intel: Acquires 64-bit Alpha chip operations from DEC

Microsoft: Ships prebeta 64-bit development kits

1999

AMD: Discloses details of x86 64-bit SledgeHammer

IBM: POWER3, RS64-III

Intel: Demonstrates first computation cluster using Itanium

Microsoft: Ships Windows NT

Compaq DEC: Alpha EV67

2000

AMD: Releases SledgeHammer & x86-64 spec

IBM: Announces it will build Alpha processors for Compaq

Intel: Ships limited quantities of Itanium

Microsoft: Demonstrates 64-bit Windows

Sun: UltraSPARC II

HP: PA-8600

200 to 300 cycles for that memory to come in and accomplishing nothing in that time period while you're waiting for data to come back from memory." Weber goes on to say, "There are a lot of other 'tricks' that are used in processors to avoid this problem—out-of-order execution being the most obvious (which is used to expose memory requests much earlier so that you can actually do work while the memory request is outstanding), also prefetching and things like that. But even [with] all of those tricks, in the end, sometimes you just have to wait for memory, and it's well known that the latency to first memory access is a first-order effect on the performance of processors. So we've attacked that problem very directly by putting the memory controller directly on the processor."

There may be drawbacks to locking maximum memory speed and type to an integrated northbridge on the CPU instead of a separate chip on the motherboard. This means that you could be stuck if you want to upgrade as faster memory standards come along. At this time, AMD is not saying that future standards such as DDR500 will work with today's 64-bit processors. They may work, but no guarantees. According to AMD, however, when the Athlon 64 chips were designed, the memory controller was cordoned off from the rest of the processor architecture to accommodate the market reality that memory never stands still. In anticipation of newer memory availability, the memory controller is not deeply intertwined and can be reworked separately. This won't help current owners, but it should benefit the platform going forward.

HyperTransport technology ("White Paper: HyperTransport Technology," *CPU* November 2002, pages 42 to 45) works in concert with the integrated memory controller, according to Weber. "Since the memory controller is not separate from the CPU, we don't have to drag memory data back and forth across this bus, but instead all of the bandwidth of that interconnect can be used for I/O operations getting your graphics data out to your graphics card and moving your data back and forth to your disk and your network. So the HyperTransport bus increases the total amount of bandwidth available to your I/O subsystem and the memory controller onboard reduces the load on that I/O subsystem, which again gives much higher performance in I/O intensive environments."

Where the FX and standard Athlon 64 differ is in the actual bandwidth of the memory controller. The higher-end FX's will carry a 128-bit memory interface, while the non-FX mainstream processor will sport a 64-bit memory interface. The difference of total theoretical bandwidth is two-fold, with 6.4GBps for the FX and 3.2GBps for the standard Athlon 64. With the FX being carried over from the Opteron, systems will require the use of registered DIMMs. Non-FX systems won't have this requirement and can use cheaper and easier-to-find unbuffered DIMMs.

Performance gains. Our testing (see page 22) indicates that, except as noted below, performance gains for 32-bit apps over Athlon XP 3200+ range from 1% to 84%, with the average increase in performance being 22.5%. There were apps that ran slower on the FX-51. The Content Creation applications in View Perf 7.1 that ran slower averaged a 20% drop in performance over the XP, while SiSoft Sandra 2003 benchmarks averaged a 9% drop.

The 64-bit Gamble

What does AMD have to say about the possibility that all this great technology may not gel in the marketplace? Weber is very confident in saying that for the server and workstation space, the rollout is long overdue. "Workstations for years have been over-constrained by being only 32-bit capable, and it's amazing that the 32-bit x86 processor has done as well as it has in the workstation and server space because it really is a race car with tiny little wheels. So the early size of adoption is going to move very quickly to take advantage of 64-bit capability. In the desktop, we think it will move quickly, but whatever pace 64-bit adoption moves at, we think we're in the right place with our 32-bit processor, with the investment protection that when 64-bits is necessary, the processor is there ready to do it. So in a sense, it can't fail. We're absolutely certain 64 bits will happen and that we took the right approach."

What Else Is Up AMD's Sleeve?

AMD has long been an advocate of automation in manufacturing process control and may well be at the forefront of designing, integrating, and implementing the complex software that is increasingly a requirement for modern large wafer, small die microprocessor fabrication. Although AMD wasn't even talking publicly about these technologies until quite recently, Bob Johnson, principal analyst with Gartner Dataquest has said, "AMD has a leadership position in process control automation. They have developed a comprehensive suite of software to automate fab operations." Or as one AMD engineer put it, "This industry is kind of a hybrid of electrical engineering, mechanical engineering,

2001

HP: Acquires Compaq, including DEC

IBM: POWER4

Microsoft: Plans Windows XP 64-bit Edition for Itanium

SGI MIPS: MIPS-derived first 64-bit processor designed for use in space

Sun: UltraSPARC III

2002

AMD: Demos 64-bit Hammer systems to journalists running 64-bit Linux kernel, 32-bit x86 and 64-bit x86-64 applications

Apple: Announces it will be using IBM 64-bit processor

Fujitsu: SPAC64V

2003

AMD: Opteron for servers, 940-pin Athlon 64 FX-51, 754-pin Athlon 64 processors for desktop

Apple: Launches first 64-bit desktop computer IBM PowerPC G5-based Power Mac

IBM: PowerPC 970

HP/Compaq/DEC: Alpha EV-7 supports "switchless/glueless" 64-way multiprocessing

Microsoft: Window XP Professional for AMD64 beta

chemical engineering, device physics, and a whole bunch of things that come together to create these very complicated circuits."

AMD and Intel buy the same tools, but AMD recognizes that as the big player, Intel has a greater mindshare of the equipment supplier community. So the opportunity to push innovation there is not a big one for AMD. What it can do is innovate on the implementation side and get a competitive advantage through manufacturing science and know-how and applying control software and manufacturing execution software to run a much more efficient operation. Although Intel cannot be outgunned, as it has virtually unlimited ammo, it may be vulnerable to being out-aimed. So AMD trains its sights on a limited number of specific targets, transistor performance for instance, and focuses deliberately on getting as close as possible to that target each time.

As AMD's Automated Precision Manufacturing becomes fully implemented, seeing real humans in the cleanroom environment will become more unusual.

Once a chip is designed and proven, in order to get it into your home PC at a reasonable price, it has to go into mass production. The standard manufacturing model for IC (integrated circuits) is pretty straightforward: Create a set of design rules for each step in the manufacturing process and have a bunch of equipment set to perform each step exactly as it was performed during the development process to maximize the transfer of technology from R&D to manufacturing. Tweak as needed to achieve mature yield, and once you've reached the set goal of so many acceptable dies per wafer, freeze the process "recipe" so it becomes more or less static. Success is defined in terms of the best replication of all steps in the process in the fastest possible time. This is a good production method, especially if you are making toothbrushes. But the engineers at AMD don't believe it's the best way to cook a batch of modern microprocessors.

Better Electronics Through Chemistry

For this the engineers use a technique called APM (Automated Precision Manufacturing) that captures the dynamics of a process and adjusts variables on that process to keep on target. APM is actually derived from the chemical process industry. They looked at how modern oil refineries and chemical plants run and applied traditional control technology to their IC fabrication process. This involves isolating and compensating for variability at every step and to such a degree that the final outcome becomes predictable.

AMD's integrated suite of more than 200 AMD-patented or patent-pending technologies works through things such as feedback and feed-forward control, dynamic targeting, and sampling the process based on the uncertainty of that process (as opposed to having some fixed rule of sampling once every eight hours) to move away from a static operating model where the process is run, gets to a mature yield, and then is never changed. "The problem with that model is you have multiple pieces of equipment that are all slightly different, and each one of these processes in our industry has reactions and things that are very typical to dynamic manufacturing, inherent in them. As a result, if you don't change things, you're going to live with a high degree of variability, and that means your signal-to-noise ratio is going to be very low and you're not going to be able to predict anything," says Thomas Sonderman, AMD's Director of Advanced Process Control, Wafer Fabrication Group, and a chemical engineer himself. "You're just going to have to set it up and start running and hope you get what you want. But it's kind of like peeling back an onion: When you start pulling out more and more variability, your signal to noise goes up, and as a result, you can get much more predictive in what you're able to do."

How far does AMD go to track variables in the manufacturing process? Sonderman reports that for the past 10 years (going back to 150mm wafers) AMD has tracked every die on every wafer going through the fab. Using a universal coordinate system to determine each die's position on each individual wafer allows AMD to very quickly isolate a product-related failure or a wafer-level failure right down to on which wafer, and where on the wafer, the failure is happening. This is obviously essential to defining where problems are originating so they can be quickly identified and tools can be brought back online as soon as possible. For tool performance variations, it's finding the right conditions to run a tool and making sure it runs that way day in and day out, regardless of where it is in its maintenance cycle, while monitoring tool output as a control for consistent performance. We recently had the opportunity to spend a good deal of time querying Sonderman about AMD's unique approach to automated manufacturing. We'll attempt here to pass our gleanings on to you.

Automated Precision Manufacturing

AMD has designed APM to encompass several interacting component processes that all start with designing a product to meet customer needs and end with selling that customer the product at a price that

keeps you and I in Athlons, and AMD in business. In between is everything that must occur to turn component materials into processors. There are several areas of technology deployment happening simultaneously in the fab. Integrated Production Scheduling is primarily a cost-saving automation that involves allocation and movement of materials to keep the manufacturing process operating efficiently. Equipment Performance Optimization monitors and maintains the tools used for fabrication; APC (Advanced Process Control) tracks, updates, tweaks, and oversees the individual recipe for each step in the fabrication process; and Yield Management Systems keep score on abnormal dies to isolate and identify where things went wrong, which could be anything from a faulty tool to defective materials. By definition, this cannot be a static process. Without continuous, customer-centric product improvements, AMD risks being overwhelmed by its much larger competitor.

Integrated Production Scheduling. As companies move to 300mm, they will have to implement more automated factory controls. Having already integrated "place & go" materials processing at 200mm, AMD plans on incorporating a "revolutionary" technology into its 300mm operations: ABS (Agent-Based Scheduling). Through the crafty use of software, ABS turns manufacturing components into anthropomorphic, well, ants, capable of making decisions and negotiating their own deals. Sonderman spilled some details, and this is what we picked up: There are lots (a lot is 25 wafers), wafers, and pieces of equipment in a fab. Wafers are trying to maximize their value at the lowest possible cost. Equipment is trying to maximize its utilization, uptime, and efficiency. So they each have different business rules or goals that they want to achieve. ABS enables each piece of material or machinery to advocate for its goals.

He gave this example: "A wafer comes out of a given lot and says, 'I'm going to predict what my output is going to be based on everything that's happened to me, based on my pedigree.' Then it says, 'Now I need to go get another thing done to me. I need another film put on me or I need another masking operation done to me.' But now it says, 'Well, what's my priority? Am I a standard process? Am I a hot lot? Do I have a customer that needs me in two weeks vs. four weeks?' Then the wafer goes out and negotiates with different tools. Maybe there are five different tools that could achieve his objective function, and he is going to go out and negotiate with them and say, 'Which of you tools is going to allow me to get done to me what I need done at the lowest possible cost?' And each tool obviously has its own business conditions trying to stay running. A tool may be coming up for routine preventative maintenance, so it may be a lot harder for that tool to meet the objective function vs. the other tools, and so it may choose to go down for maintenance and have that lot go to a tool that is more capable of achieving whatever it is that particular wafer needs. So when you start doing those kinds of

AMD64 In A Nutshell

Just in case you don't have a knack for memorizing long lists of processor specs but still want to be trendy, here's a little AMD64 crib sheet. Enjoy.

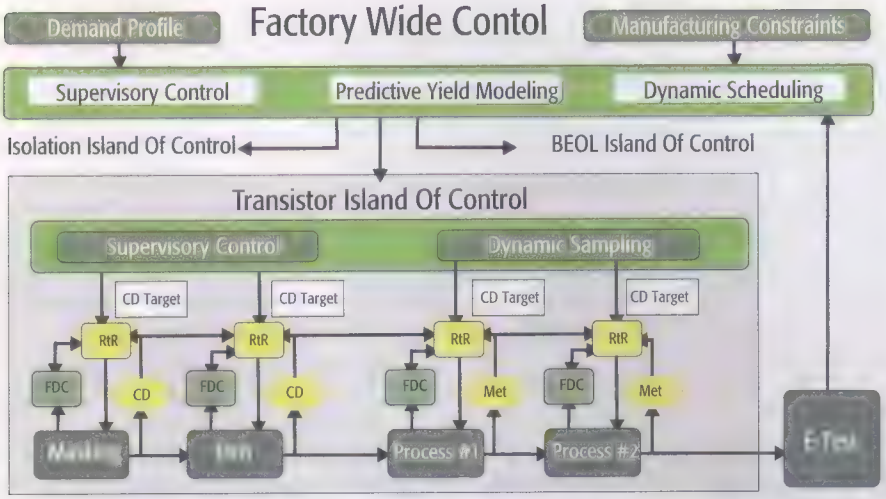
Legacy mode. Being fully backward-compatible with direct execution using native 16-bit or 32-bit code on a 16-bit or 32-bit OS, no recompile is required for legacy mode. It functions just like an Athlon or Athlon XP, but with 20% to 25% performance improvement for most apps. This is how most of us would be using AMD64 if it arrived on our doorstep today.

32-bit compatibility mode. A new 64-bit OS is required for 32-bit compatibility mode, which supports x86-protected mode only. 16-bit and 32-bit code is directly executed by the CPU with no requirement to recompile. This mode doubles the process size of 32-bit Windows (currently limited to 2GB) to enable larger (up to 4GB) apps. The new 64-bit OS provides 32-bit libraries and "thunking" layer for translating 32-bit system calls to 64-bit calls, and AMD64's additional/wider registers are not accessible in this mode. Performance is similar to legacy mode with potential benefits for disc I/O dependent apps and some potential penalty for "thunking."

64-bit mode. Naturally, a new 64-bit OS is required for this mode. In order to run, all 32-bit apps must be ported/recompiled to 64-bit, including all kernel-level programs, drivers, and anything linked or plugged in to the app, even hardware drivers that the app installs. A 64-bit app can access 32-bit libraries in this mode. Users will see a performance increase over 32-bit apps due to additional registers and increased complexity due to memory addressability beyond 4GB.

Registers. AMD64 x86-64 has a 32-bit x86 machine within the 64-bit machine. Additional functionality for 64-bit mode includes eight more 64-bit GPRs (general-purpose registers) as well as 64-bit versions of the original eight 32-bit x86 GPRs, doubling the number and width of GPRs. SSE support includes eight new SSE registers and the addition of SSE2 support. Legacy x87 technology is included for now but will be phased out and replaced by SSE over time.

AMD64 core improvements. Athlon was great, but AMD64 includes bigger and better branch prediction, deeper pipelining (with two additional pipelines) that allows higher clock speeds but decreases IPC (instructions per clock), higher bandwidth for both L1 & L2 cache (effectively doubling bandwidth), and lower latency for L2 cache. An increased number of entries in TLB (translation lookaside buffers) are aimed at the server market but benefit 3D rendering on the desktop, too. AMD64 has double the number of SSE registers and the addition of SSE2 support and double the number and double the width of GPRs (general purpose registers). The integrated on-chip memory controller provides lower latency memory accesses and is aided by processor-level transistor technology. The downside of an on-chip memory controller is lack of support for new memory standards as they emerge.



As AMD ramps up 300mm wafer fabrication, the interactions of all elements come together.

things, then you are talking about this fully integrated, highly controlled fab environment where wafers are negotiating with tools in order to maximize the profitability of the fab. And that is analogous to how chemical plants are run today."

This is not yet how AMD operates. "Today we're doing it with real-time dispatching so it's still somewhat reactive and doesn't have the ability to learn, which is what ABS technology delivers." 300mm is getting busier by the minute.

Advanced Process Control. Today AMD has about 70% of its processes under APC-based control. Which means that variables such as temperature, pressure, flow rates, and time can be slightly modified to ensure that the process will deliver what the customer wants (the "objective function of the target volume," as AMD calls it). An important way of thinking about semiconductor manufacturing goes back to the chemical industry's use of "recipes." Sonderman explains, "Instead of just putting your cookies in at 400 degrees and hoping that in 12 minutes they come out exactly like you want them, what we're doing is adjusting the time a little bit and adjusting the temperature a little bit, and maybe even moving the cookies around a little bit in the oven to ensure that every cookie on the cookie sheet comes out exactly the way we want them and they all look and feel and taste the same way. So the recipe is the same and the mean temperature that they all see may be X, but we may do some subtle things during the cooling sequence to ensure that they all come out the exact same way."

In addition to wafer-level recipe control, APC encompasses fault detection and E-Diagnostics, next-generation SPC (Statistical Process Control), and eventually, integrated fab-wide control. These features have the ongoing task of producing rapid product performance improvement. Designing manufacturing processes and controls with this in mind is central to Sonderman's approach. "One of the things that we are certainly driving at AMD is putting more and more of the design for controllability and the design for manufacturability into the whole process development mindset so that when processes are delivered to manufacturing, they automatically have the ability to be controlled in a very precise manner. . . . A lot of people talk about advanced process control, but there's always some human, a technician, [who's] verifying the decision. What we've decided is that if people can control very complicated chemical plants that can blow up and do very nasty things if they don't run right, we believe we can take that similar technology and do it in an equivalent fashion in our industry, and that's what the genesis of the whole thing has been."

An AMD Fab30 employee poses for the camera.

Yield Management Systems. For every new product, AMD performs an analysis based on the complexity of the product, the number of fabrication steps, the number of metal layers, and the critical dimensions that are going to be used to define the operating geometries. Engineers then come up with a yield entitlement, which is what the yield needs to be for a particular process to be profitable at the optimal manufacturing margin. The ability to ramp as quickly as possible to this yield entitlement or mature yield is especially important for AMD because it only has one fab. To start using up material for a new product on a new process that has subpar yield would be to sacrifice profit margin.

These are the business realities behind rumblings from this or that manufacturer saying that a product has been delayed due to low yield. It may have little to do with whether a given product is performing as expected, but if the percentage of unusable products coming off the line is higher than the factored allotment, the manufacturer cannot make a profit.

According to Sonderman, the Athlon processor ramp rate was the best for a new product in AMD's history, and ramping to mature yield for Opteron actually reduced that timeframe by two-thirds. International SEMATECH (sematech.org; a global consortium of semiconductor manufacturers) benchmarks AMD's fab as consistently best in class in key efficiency areas. For the fab to be accelerating at its best previous ramp rate by that percentage and still be a year later to market than expected really paints the picture of how hard this is. In researching

the 64-bit Processor Timeline for this article, it became obvious that delays of a year or even multiple years are so common as to be predictable.

Equipment Performance Optimization. Sonderman outlined how various data-mining software is used to take a huge, routinely updated database and cycle that data through analysis routines, doing commonality analysis, correlation analysis, and similar types of operations. The software then spits out which particular process steps are in jeopardy. The APC technology then advises engineers to look at a particular tool to see which sensors, pressure gauges, or mass flow controllers (the things that actually drive the process) are operating abnormally. For this the software does not need to have a vast knowledge of every possible problem with a piece of equipment. It just uses fault detection and E-diagnostics to ascertain the health of the tool to decide if the current state is different from a known good state. If the tool is processing abnormally, it can be shut down to prevent producing bad product. As larger wafers are introduced, this becomes even more critical.

International SEMATECH's "Wafer Sleuth" yield-management system is helping AMD quickly determine where yield limiters occur.

Automating for 300mm. Sonderman paints the picture for us. "So what we see for 300mm is that everything is automated. You're doing wafer-level, fully automated control; all the material movement is fully automated. You are going to a much more die-based and wafer-based analysis versus analyzing lots and material within lots. You're really doing everything at a wafer-level, and you really get to the chemical processing facility model where you have a control room environment. You really don't have people in the fab, other than people who are handling unique operating conditions or exceptions, and the fab is pretty much being run through software. Obviously you have a lot of very intelligent people creating the software, and people who are required to fix the tools when they go offline, but it's not like in a traditional fab where you have a lot of people moving material around, and you have a lot of people standing in front of tools making decisions."

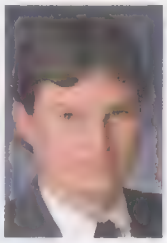
This contrasts with AMD's current state of automation. At this point, while a process is running, the software is not actually manipulating the process within the run. That is all being done based on the inherent tool software. Between runs and on a run-to-run basis, the software can modify what the recipe looks like, in many cases, without actually having metrology (measured results) available. Every lot is controlled within the fab, and then certain lots are marked for metrology. That measurement then feeds information back into the controllers to ensure the right process adjustments are being made. Run-to-run control is about defining the process settings for a given lot of 25 wafers. In the future, and to a small extent today, there will be wafer-to-wafer control, which is the ability to change the recipe for each given wafer.

AMD has done benchmarking in preparation for the migration to 300mm. Sonderman is confident: "We have a capability that is second to none in terms of how we run our manufacturing operation."

Why isn't everyone doing this? Well, it's very difficult for one thing. Understanding all the variables for even a single step in the manufacturing process is a challenging task. Multiply that by 600 or so steps, and you are in the area of formidable. Tying that into all the tools, machinery, and tasks involved in running a modern fab that are not directly tied to any particular step; converting that human know-how into software tools that can factor in all variables, interactions, and potential outcomes; and determining which variables to tweak to achieve the specified outcome takes a very special kind of software designer; actually, a lot of very intelligent software designers.

Also, it isn't absolutely essential (yet). Intel appears to be working at 90nm without full automation. The company's Copy EXACTLY! model of duplicating the manufacturing process across many fabs over vast distances seems to have worked for them. Perhaps it is because, with the volume of product Intel sells, it is more cost-efficient to throw away a higher percentage of bad dies than it would be to fully automate as AMD is doing. Other top manufacturers have implemented some form of APC, but AMD's methodical approach is more widely deployable because it has created the framework to apply these principles anywhere in the system. So rather than focus only on certain process steps that have the highest degree of variability, AMD can apply them to any step in the fab and chain them together. Eventually, the process will be too small to not be fully automated. At that point, whoever hasn't built the necessary know-how to automate processing will have to acquire it.

Richard Heye On Building Infrastructure



Richard Heye shares his job title as vice president/general manager of AMD's Microprocessor Business Unit with Marty Seyer as one of "two in a box," overseeing all marketing, platform engineering, infrastructure development, and program management functions for AMD's Computation Products Group. Before coming to AMD in 1997, Heye was at Apple Computer and Digital Equipment Corporation, so he knows a thing or two about building infrastructure and 64-bit computing products. Heye recently sat down with us (twice) to discuss the challenges of building

the necessary infrastructure to support AMD64. Here are highlights from our discussions. (Subscribers can see additional interview content online at www.cpumag.com/cpunov03/heye.)

Not the Intel model. "When AMD started to go and design its own infrastructure, we explicitly made a conscious business decision not to get into the motherboard business. One of the reasons we decided not to do that is we wanted to be able to really work with our partners and they should never feel threatened. They should never feel like we could take away their business. Because we didn't want to compete with Taiwan, we wanted to work with them collaboratively. . . . In our chipset business, for example, we do make chipsets, but unlike Intel, when we do a chipset any unique intellectual property that's needed to communicate, for example, to our microprocessor, we give that IP royalty-free to anyone who wants it. . . . We're not going to tell NVIDIA or ATI or VIA or any of those guys how to do a graphics engine. They do that better than we do. We will say, "If you want to talk to the microprocessor and you want to use the Hyper-Transport bus, we'll give you as much technical support as you need to be successful in order to bring your product to market as quickly as possible. And that is not the Intel model. . . . So, by having collaboration, by having good business cases, we have a very robust infrastructure. Case in point is: We're announcing our eighth-generation microprocessor, Athlon 64, and we're going to have chipsets from NVIDIA, VIA, SiS, and ULI (formerly ALI), at launch. And that's pretty darn good. We're going to also have a wide variety of motherboards from all the major motherboard vendors. . . . The reason they're doing that is that they have faith that AMD is going to be able to bring Athlon 64 to market and we're going to be able to drive the industry. Because at the end of the day, if they can't sell motherboards or chipsets, they're not going to do it."

"The idea of open cassettes and making the environment as clean as possible has gone away. Now there are minienvironments with a class-one clean room inside a wafer transport mechanism, and the actual environment outside that can be less stringent," says Thomas Sonderman of AMD.

We did our own chipset. "When I arrived, there was no infrastructure. Or I can phrase it differently: When I arrived, there was a beautiful infrastructure; they didn't even need me. Because when I arrived, they were just announcing K6, and K6, along with all the previous microprocessors that AMD had built and brought to market, were all Intel-compatible interfaces. So I could take a K6, buy any motherboard in the world that worked with an Intel processor, [and] plug it in and it just worked. So to some extent for K6, I was just incremental head count. . . . Now when Athlon came onboard, that was a challenge because that was the first time in the history of AMD in the microprocessor division where the interface was no longer compatible with Intel's. . . . So the first thing we did, quite frankly, was we did our own chipset because at that time we had no credibility. VIA, ALI, and SiS were the three major chipset vendors for that timeframe, and there's no way they were going to go and embark on a brand-new chipset for AMD with no track record. . . . So we did our own chipset and we did our own reference design. We designed internally a standard Taiwanese-class motherboard that worked with the microprocessor."

'OK, we'll do one motherboard for you.' " . . . The first challenge we faced was going to Taiwan and saying, 'Listen, we would like you to take this reference design, do what you do best—make necessary modifications to meet your specific needs—and ship that board to work with AMD Athlon.'. . . We actually had to show them a working motherboard and say, 'Hey, this is for real, we're not making this up. We have a technically viable part, and it actually works really well.' Athlon was a fine, fine part. To the motherboard vendors' credit, they actually said, 'OK, we'll do one motherboard for you.' It was sort of a test case from their point of view. When I say 'give them credit' you have to understand it was not to their advantage to do an AMD motherboard because they already had a whole line of Intel motherboards—that was the major part of the market—and obviously they didn't want to gratuitously annoy Intel because you don't want to annoy a major vendor, and yet they actually did it. And two things happened: They started making money on it and they started growing our market share. Because Intel does their own motherboards and we don't, they were able to grow their share pretty quick. The wonderful thing about infrastructure in business is if there's a market and you can meet the market needs, you can make money . . . it was really hard to kickstart that momentum in the beginning. I can remember literally week in and week out tracking exactly the number of motherboards that were produced in Taiwan, down to the single digit, and just tracking it and getting that infrastructure ramping up. . . . In the old days it was trying to get one motherboard. Now some of these top vendors have three, four, five, six motherboards for AMD in the

. . . We actually had to show them a working motherboard and say,
'Hey, this is for real, we're not making this up.'

works, using different chipsets, going after different targeted markets and segments."

16 time zones later. ". . . I learned early on that you always have to be honest to get their trust. In any big engineering projects, you have good days and bad days. On the bad days, you just tell them, 'Hey, we got these problems but we're working through them. Stay with us and as soon as we fix the problems, we'll pass it on to you and we'll keep going.' I think that sort of really open relationship with third-party vendors actually got us a lot of respect. . . . We've built this fairly large Taiwanese lab where now we have a lot of support for the motherboard vendors locally. Because the reality is that if you are producing a motherboard in Taiwan, you want pretty quick access to technical support. You don't want to wait 16 time zones later to call Austin, Texas, you want to be able to just pick up the phone and talk to someone in your own language and in your own time zone."

From an art to a science. "The proof in all this is that in the history since Athlon shipped, you can search for all the stories you want, and you won't find a story that says the AMD infrastructure is melting down, [that] it has quality problems. We had availability the first two or three quarters of the Athlon ramp because we were growing and we had fits and starts for a while, but once we got over that knothole of figuring out how to work with Taiwan, set up processes and procedures, got the lab in place, it's been working really well. I'm not saying it's easy, but it went from an art to a science. . . . That's where we are on infrastructure right now; it's running pretty good."

Back On Planet CPU

If only things went as smoothly on the street where were we live. Our big plans for a spicy Athlon 64 motherboard roundup picnic (see the article on page 60) were rained out by availability issues for all but six of the boards (with a few ants walking around on some of the boards, as performance was mixed). But we'll revisit those issues in the future. Until then, we've had a blast bringing you more of the bigger picture . . . INSIDE AMD. CPU

by Joan Wood

Intel's Two Cents

As the world's largest producer of desktop processors and AMD's primary competitor in that market, we were curious about Intel's take on AMD's introduction of 64-bit computing for the desktop PC. We turned to Intel Spokesperson George Alfs, who expressed Intel's position in this way:

"Intel and the industry are focused on bringing benefits that PC users can take advantage of now—areas like wireless connectivity; greater multitasking performance via Hyper-Threading Technology; and easier/faster connectivity for PCs and servers with technologies such as USB 2.0, PCI Express, and Gigabit Ethernet.

"Adding 64-bit addressability means little without the necessary software, related tools, utilities, and technologies to ensure the PC performs at its best and can work with applications and peripherals. With just 5% of servers using 64-bit memory addressability, there is little need for 64-bits on the desktop today.

"The Pentium 4 processor 3.20GHz with groundbreaking HT Technology provides up to 25% higher performance in some cases than an equivalent non-HT enabled system and enables a better user experience in multitasking environments and with multi-threaded applications."

P4 Extreme Edition. Not that Intel is nervous or anything, but it looks like it also wants to play in the high-end gamer's market. Just before this issue went to press, we received a spiffy new CPU from Intel called the Pentium 4 Extreme Edition (watch for benchmarks in the next issue), which comes with an additional 2MB of on-die L3 cache. Add that to the P4's current 512KB of L2 cache, and we're talking about a whopping total of 2.5MB of total cache. As a result, the transistor count shoots up from 55 million for the Northwood P4 to 169 million for this P4 Extreme. It will debut at 3.2GHz and with the standard 800MHz frontside bus. The CPU itself sounds much like a Xeon on crack for gamers, and we can hardly wait. Just to whet your appetite, here are a couple of teaser benchmarks: Quake III turned in a score of 463fps, and 3DMark03 came in at 6023. Expect a full review and comparison to the Athlon 64 FX-51 next month.

Apple's G5: The Other 64-bit Consumer Processor

Athlon 64 isn't the first time that a 64-bit processor has shown up for desktop computers. Apple recently released its G5 system, based on IBM's 64-bit PowerPC 970 processor, which Apple CEO Steve Jobs named "the world's fastest personal computer." We don't know about that, but just like the Athlon 64, the G5's CPU is based upon a 0.13-micron SOI (silicon-on-insulator) process and is a 64-bit chip that can run 32-bit applications natively.

Running at 2GHz and with only 58 million transistors, the G5 is not as fast as the FX-51's 2.2GHz speed, nor is it as packed with trannies as the Athlon 64 with 105.4 million. In fact, the G5 processor is closer to the Athlon XP processor's 54.9 million transistors. It's a bit short in the L2 cache department, too, with only 512KB compared to the Athlon 64's 1,024KB. G5 systems are similar to the FX-51, as 400MHz DDR memory is used across a dual-channel 128-bit 6.4GBps bus. Apple has shown performance numbers that reflect well upon a G5 vs. a dual Intel Xeon 3GHz system, but funnily enough, the Opteron wasn't in the comparison.

According to Jobs, the G5 was designed to be SMP (Symmetric Multi-Processing) from the ground up, and even though a dual G5 is available, we'll be waiting for the cows to come home before it touches an eight-way Opteron system. A 3GHz G5 is apparently due out by Q3 of next year. We're sure you can hardly wait. . . .

Everyman's Next Mobo?

We Inspect Early Athlon 64 Boards To Find Out

You can't blame AMD for wanting to lead off with the Athlon 64 FX-51. AMD wants to make a big splash with the release of its much-anticipated new platform, and as the superior processor in the desktop Hammer lineup, AMD needs reviews showing how its new platform blows the Pentium 4 out of the water.

And yet, waiting in the wings is the 754-pin Athlon 64, the mainstream CPU that will be available in vastly greater quantities and lower prices than its 940-pin counterpart. AMD did us a mammoth favor by helping us obtain a 754-pin chip before most reviewers so we could have a motherboard review in this issue. The downside, though, was hunting for boards to review. NVIDIA, for example, boasts well over a dozen partners who will release nForce3-based motherboards for the Athlon 64. Of those, only three had presentable parts ready in time for this article. On the other side of the fence, VIA's K8T800 chipset was ready long before the nForce3, but most vendors held off on producing boards, knowing that the 754-pin release would come later than the FX. Two of our three VIA boards were rushed to us straight from Taiwan just hours before this issue closed.

So we have good news and bad news. The good news is that the Athlon FX platform competes very well against the likes of Intel's 865 chipset with, say, a 3GHz Pentium 4C. As of this writing, AMD has yet to release pricing for its new mainstream chips, but if it undercuts the P4C by a decent margin, AMD will be back in the CPU game and running strong. If AMD tries to position the Athlon 64 line at the same price level as its equivalent Intel competitors, it will lose. The chips are simply too close in performance, and 64-bit apps are still many months to years away from everyday use in the mainstream.

Our test platform was based on an Athlon 64 3200+ with reference heatsink, two sticks of Kingston HyperX, an ATI Radeon 9800 Pro with 128MB running Catalyst 3.7 drivers, a Maxtor DiamondMax 200GB hard drive, and Windows XP Professional with Service Pack 1. All chipset, BIOS, and driver sets were the most current available.

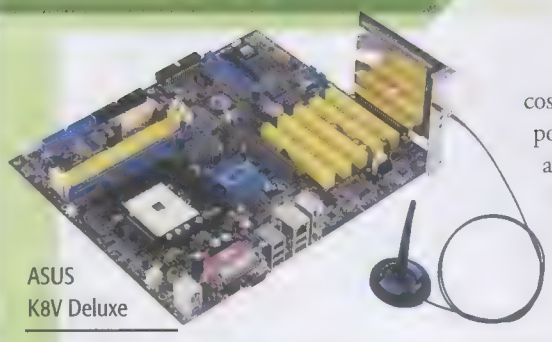
ASUS K8V Deluxe

Just ask any pop music sensation: Staying on top is hard work, and sometimes the best you can do is to settle for No. 2 on the charts. We installed the BIOS update du jour right before going to press, reran the numbers, and still had to concede

How Our Athlon 64 Boards Size Up

Here's how the early Athlon 64 boards vendors sent us performed in our benchmarks. Note that the MSI K8T Neo-FIS2R scores are based on using Corsair TwinX modules instead of the Kingston HyperX modules the other boards used.

		3DMark		Quake III		Unreal Tournament 2003	
Vendor	Model	2001 SE 640x480x16	2003 1,024x768x32	640x480 Normal	1,024x768 Normal	Flyby 1,024x768x32	Botmatch 1,024x768x32
ASUS $158 (street)	K8V Deluxe	19410	5798	393.3	381.7	249.823	106.85
Biostar $139	K8NHA Pro	23069	5776	393.3	379.3	248.022	105.596
FIC $129	K8-800T	23613	5806	389.7	377.2	267.953	105.489
Gigabyte $199	K8NNXP	23790	5761	392.6	375.5	247.842	105.286
MSI $155 (street)	K8T Neo-FIS2R	15062	4770	193.4	188.5	200.108	87.452
Shuttle $169	AN50R	23561	5783	401.8	385.6	249.259	106.957



ASUS
K8V Deluxe

that ASUS, although turning in yet another in a long line of hits, didn't sweep the benchmark field here. But so what? More importantly, the K8V was a virtually trouble-free journey.

We did encounter one road bump. Being the first VIA-based board we tested, we inadvertently installed our drivers out of order, implanting the ATI drivers before the VIA 4-in-1 set. As it turned out, this had a serious impact on our scores. Per ASUS' suggestion, we deleted both, reinstalled the 4-in-1 set first, and were much more pleased with the results. Our 3DMark 2001 SE scores were still off, but the 2003 version remains a truer look at the board's modern graphics capabilities.

There really isn't much to say about the benchmark scores. Whether looking at VIA or NVIDIA, these boards mostly hit within a tight pattern right around the bull's-eye. ASUS didn't jump ahead of the crowd on any given test, but we also wouldn't be surprised if another update or two didn't help boost some of these figures by the time you read this.

The real strength of the K8V Deluxe is in the little extras it packs on for very little cost. You receive an extra parallel ATA port and two extra SATA connectors along with an extra Promise RAID chip. Interestingly, this gives you RAID 0 and 1 for the two primary SATA headers while you can have separate RAID 0, 1, and 0+1 from a combination of the extra two SATA and parallel connectors. The back panel features a 3Com Gigabit LAN port, four USB 2.0 ports, one FireWire port, and the usual audio jacks, but then ASUS tacks on an SPDIF connector for the 5.1 ADI audio chip. Four more USB ports and one more FireWire port come on rear-panel extensions, and there is an SPDIF-out riser. Not the least of all, there is a Wi-Fi header hiding in the shadow of the last PCI slot, although the actual 802.11b adapter isn't included.

The only exception we take to the board's feature placement is having the 12V power connector right behind the PS/2 ports. If you're not careful, this can leave the 12V cable draped across the CPU fan, which is always cause for worry. Everything else, though, was impeccable. On top of the usual list of utilities, ASUS throws in InterVideo's WinDVD Suite, sweetening an already value-rich pot.

Biostar K8NHA Pro

more SATA ports, PATA RAID connectors, and (kind of a big one here) a third DIMM slot might go, so look for more deluxe versions in the future that will add to the nForce3's native beauty. But catch that $139 price! And that's the list price, mind you. Biostar hits this incredibly low number by carving off some icing, but there's still plenty left on the table.

With a red PCB and very clean layout, the board features four USB and one FireWire port on the back, along with LAN, standard audio, and legacy ports. Unfortunately, we had to guess at the extension ports because Biostar could only send us a bare board with a driver disc, but it looks like it only has one USB and FireWire header and one wireless LAN slot.

With the exception of one odd blip in 3DMark 2001, Biostar is so close to catching ASUS in our tests that it's amazing the boards use different chip-sets. Biostar's performance is outstanding all the way across. As the best bang for the buck, there's no question that the K8NHA Pro wins the day. For power users who might need more room to grow, as in everything from memory slots to audio to expanded RAID, we'd suggest waiting for a version with more of the real estate filled in.

K8V Deluxe

$158 (street)
ASUS
www.asus.com

K8NHA Pro

$139
Biostar
www.biostar-usa.com

Comanche 4	PCMark 2002	WinAce
1,024x768x32	CPU:Memory	200MB folder
67.96	6556:8827	2:01
67.73	6514:8759	2:02
67.39	6494:8968	2:25
68.01	6516:8692	2:04
59.57	6531:8254	2:02
68.08	6510:8956	2:02

Biostar K8NHA Pro

Biostar took considerable time to explain to us the ways it is changing, accelerating, improving production, etc. All of this was meant to convey the message, "You are used to thinking of Biostar as a nobody board vendor. Now we're somebody." Looking at the nForce3 150-based K8NHA Pro, we are inclined to agree. Biostar has arrived and can now compete with the big boys.

This board has plenty of blank spots on it where such things as two

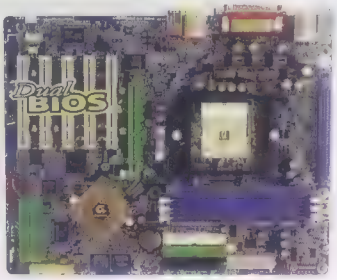
Gigabyte K8NNXP

Opening a new Gigabyte motherboard package is a bit like opening your Christmas morning stocking. It simply overflows with toys and treats that are sure to please. Gigabyte, as usual, comes in as the high-price option in this roundup, but for your extra $40 or $50, you get a lot, including dual LAN (including one Gigabit port); a dual power module; dual BIOS; two extra PATA ports with RAID 0, 1, 0+1, and JBOD; and a Silicon Image RAID chip for the two SATA ports. On the extensions, you get four USB 2.0 ports to accessorize the two already on the board,

two 1394b ports (one 4-wire, one 6-wire), and a full SPDIF-surround riser.

The board features several thoughtful touches, such as Gigabyte's habitual rounded PCB corners, crack-proof IDE and floppy connectors, and spiffy, golden cage chipset-heatsink fan, which your AGP card and drive cage will probably obscure, but it's a nice gesture. Once again, save for a stray 12V connector, feature placement is good, and the board looks well organized.

We should note that the nForce3-based K8NNXP is a $100 departure from some of Gigabyte's other flagship models. This is a smart choice. Although Gigabyte can add in some of its trademark extras, it should not bump the street price over about $180, which still leaves the board placed well and more feature-laden than most competitors. As our scores show, Gigabyte turns in great numbers for each benchmark. If your taste and budget allows for a few frills, this is probably the board to buy.



Gigabyte K8NNXP

K8NNXP

$199
Gigabyte
www.giga-byte.com

MSI K8T Neo-FIS2R

The tragedy of this roundup was MSI's K8T Neo-FIS2R, which had every hallmark of being another dark horse surprise, a la our Springdale mobo roundup (July 2003 *CPU*, page 60), but instead turned out to be a lemon unit. By the time we determined the board's defect, it was too late to procure a replacement. We did manage to squeeze out one set of complete benchmark scores, but this was under the influence of our out-of-order VIA 4-in-1 installation. By the time we had sorted this out, our K8T was no longer booting.

The problem seemed to stem from the memory controller. Right away, the board refused to boot with our Kingston HyperX modules. We went to a pair of Kingston ValueRAM modules. They didn't work, either. We then tried only one ValueRAM, which did. We finally took our scores with a pair of Corsair TwinX modules. After finishing our first round of tests, though, even this no longer worked, and we declared the unit DOA.

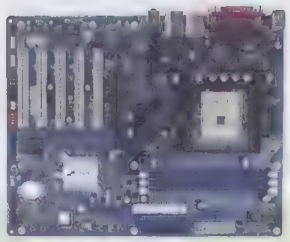
Ignoring that we drew the bad apple in the barrel, MSI's K8T Neo is a fabulous package. Just check out the back plane. Besides the legacy ports, you get two FireWire ports, four USB ports, RCA SPDIF, optical SPDIF, Gigabit LAN, and all five mini jacks for analog surround sound. There are four SATA ports and an extra PATA connector for combined format RAID. And naturally, MSI throws in some of its own trademark items, such as the diagnostic D-Bracket 2, automatic CoreCell CPU overclocking, and lots of utilities.

At the low price of $155, it is worth your while to give a bug-free K8T Neo a look.

$155 (street)
MSI
www.msicomputer.com

Shuttle AN50R

Shuttle told us that it's working like mad to parlay its hard-won optimization techniques from its XPC boards over to its ATX boards, and here's the proof. The nForce3-based AN50R turns in a showing just strong enough to top our tests and make itself the benchmark winner. Our test board—which like the Biostar board, arrived in the buff with only a box and a disc—performed flawlessly, with nary a hiccup or driver twitch to see. Moreover, the board's design is attractive and efficient.


Shuttle AN50R

True, it's easier to look clean when you don't have a lot of extras jostling for space. There are only two SATA ports, no PATA RAID, one BIOS chip, and only one USB and IR header manages to get left in the open. (All other headers are smartly tucked between the edge of the board and the last PCI slot.) Shuttle does bring on extra audio ports, a third DIMM slot, and dual LAN (the Gigabit part based on Intel's RC8254).

The back plane still features four USB ports, one FireWire, and an optical SPDIF. From the headers, we can see that there should be another SPDIF/center/bass extension, and there are two more FireWire headers. In other words, if you're willing to give up a little RAID functionality, this board actually has just about everything you'd want from a mainstream AMD platform.

AN50R

$169
Shuttle
us.shuttle.com

The Winner

Honestly, we have to call this a tie between ASUS and Shuttle. Both counterbalance each other with speed and features. Both proved extremely stable, and the pricing is competitive if not generous. You can't go wrong with either one. If your budget allows, also consider the Gigabyte. **CPU**

MSI K8T Neo-FIS2R

by William Van Winkle

(To read our review of the FIC K8-800T, you can go to www.cpumag.com /cpunov03/FIC. Also see our "A Mini-Tale Of Two Chipsets" sidebar.)

The 64-Bit Question:

Are You Ready For The Athlon 64?

Ladies and gentlemen, welcome to the Athlon 64 show. AMD's eighth-generation architecture, a hot topic since late 2000, is finally available in high-end server trim (Opteron), gaming-oriented enthusiast form (Athlon 64 FX), and in a toned-down, less expensive package (Athlon 64). All versions feature an integrated memory controller and the SSE2 (Streaming SIMD Extensions) support needed to contest Intel's dominance in content-creation applications, while the most powerful models support a 128-bit memory bus. Benchmarks indicate AMD may be on the verge of another blitzkrieg assault, the kind it executed in 1999 when the original Athlon materialized. And with Intel preparing its 90nm Prescott core, the end of 2003 promises to be a white-knuckle shootout.

Paving the way for 64-bit computing has been a struggle for AMD, though. Timely as its launches may seem, the desktop Athlon 64 and server-based Opteron products were initially intended to appear early in 2001. Granted, the K8 microarchitecture gains its heritage from the K7 design before it, but the combination of 130nm manufacturing and innovative silicon-on-insulator enhancements has certainly affected the platform's readiness. And that's just on the hardware side.

Perhaps the most-discussed attribute of AMD's K8 architecture is its 64-bit software support. Equipped with 32-bit backward compatibility, Athlon 64 promises to bolster performance in today's popular software titles without the performance penalty of translating x86 code, ala Intel's Itanium. However, the addition of 64-bit extensions is what has pundits buzzing, and exposing that capability requires a robust software infrastructure consisting of a 64-bit operating system, compliant device drivers, and recompiled apps. Thus, AMD has dedicated significant resources to ensure developers are equipped to lay the foundation for 64-bit computing.

The Benefits

Before exploring the ramifications of AMD's 64-bit vision, let's discuss the technology's potential and where it will and won't exert an influence on your computing experience. The most compelling reason to adopt 64-bit computing is to move beyond the 4GB virtual-address space ceiling 32-bit systems impose. Many apps, such as databases, content creation, mechanical CAD, and design-automation tools are capable of pushing that boundary. There are ways for 32-bit platforms to work around the 4GB limitation, but they typically sacrifice performance. Address Windowing Extensions extend virtual address space, for example, while Physical Address Extensions raise the bar for adding more than 4GB of RAM. AMD's Athlon 64 implementation circumvents both constraints, allowing as much as 256TB of virtual-address space and as much as 1TB of physical memory without a performance penalty

Moreover, the AMD64 ISA enables twice as many registers (high-speed memory locations) compared to the standard x86 instruction set. Athlon 64 makes eight registers visible to programmers in 32-bit mode, just like the Pentium 4 and Athlon XP, while apps running in 64-bit long mode have access to 16 64-bit GPRs (general-purpose registers), reducing the number of calls to memory and simultaneously augmenting performance. There are also eight more XMM (Extended Memory Manager) registers for SSE and SSE2 code. And because the GPRs are 64-bits wide, they support 64-bit integer mathematic operations. Most apps won't actively utilize 64-bit arithmetic, but AMD claims encryption and compression algorithms both stand to benefit.

There are, of course, other benefits to the AMD64 ISA, many that don't necessarily correlate to 64-bit computing. Case in point: Athlon 64's native 32-bit compatibility is a tremendous boon to mainstream users who may not have an immediate desire to adopt the latest software technologies. Further, the ability to run 32- and 64-bit apps under the umbrella of a 64-bit OS lets power users enjoy the benefits of both worlds.

The Foundation

Not everyone with an Athlon 64 will immediately migrate to a 64-bit environment, though. There are certain requirements to fulfill first, and many of the enabling technologies are still in development. For example, availability of 64-bit

OSes is still somewhat sparse. SuSE Linux Enterprise Server 8 is out, however, as are Mandrake Linux 9.0, Turbolinux 8 for AMD64, and NetBSD.

Holger Dyroff, SuSE's general manager, says SuSE has been working with AMD since mid-2000 to implement proper support into the kernel; the kernel port was quick and easy, but device driver porting and platform support required more time and careful interaction with hardware vendors. Red Hat's Linux distribution is still in a beta stage, and Windows XP for AMD64 (also in beta) won't materialize until early 2004. At least initially, power users will probably find themselves installing the 32-bit version of WinXP, forgoing 64-bit support, and enjoying the performance enhancements attributable to Athlon 64's integrated memory controller.

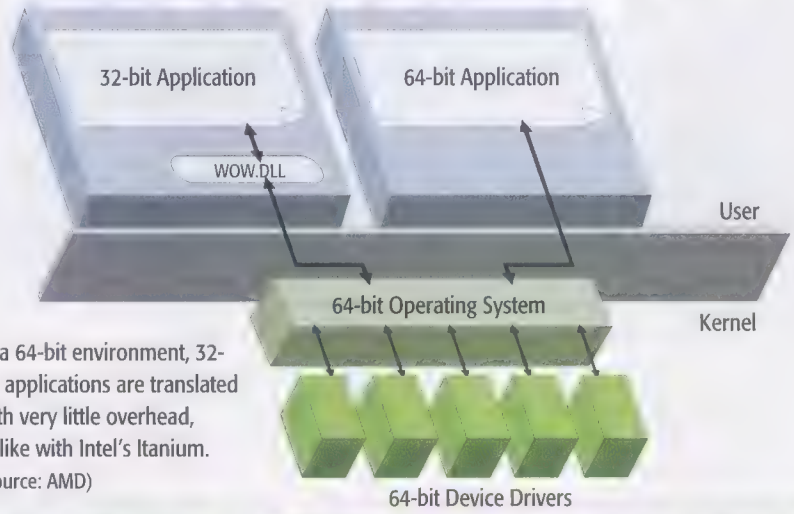
When Windows for AMD64 eventually does emerge, it will require complimentary 64-bit device drivers. Porting drivers is reportedly not difficult because the AMD64 ISA is an extension to x86. NVIDIA claims to have ported its DirectX 9 graphics driver in three steps. The first involved recompiling for AMD64 and concurrently eliminating in-line assembly language, which 64-bit Windows doesn't support. The next step was to achieve stability by disabling optimizations. Finally, NVIDIA's driver team tweaked the code path for AMD-64, paving the way for future performance optimizations, such as utilizing the 64-bit GPRs. The AMD64 Linux driver is now publicly available at www.nvidia.com.

Richard Brunner, an AMD fellow, is confident that the drivers for other common devices—USB controllers, storage devices, and sound cards—will also be finished by the time Windows ships. "Microsoft has already ported many of them," he says, "using driver code that the vendors have shared with Microsoft." For vendors that haven't yet recompiled, AMD has a team of "relationship specialists" dedicated to helping driver teams.

Fortunately, application compatibility is a much more flexible issue. The Athlon 64 can run in two operating modes: Legacy mode supports 16- and 32-bit OSes and apps, while long mode enables 64-bit OSes to accommodate both 32- and 64-bit apps. Those who buy an Athlon 64 and immediately install WinXP will be running in legacy mode. In such cases, an OS, device drivers, and apps will run exactly as they did prior to upgrading.

If, however, the 64-bit version of SuSE Linux is used (or even Windows for AMD64 early next year), long mode is invoked, exposing another fork in the road. Servers and high-end workstations that employ a 64-bit OS, driver package, and application suite run in 64-bit mode. Of course, drivers and apps have to be recompiled, so software selection will be limited, at least initially.

The more likely scenario is a 64-bit OS with 64-bit drivers, running a mixture of 32- and 64-bit apps in compatibility mode. AMD agrees and is actively testing



In a 64-bit environment, 32-bit applications are translated with very little overhead, unlike with Intel's Itanium. (Source: AMD)

64-bit Is In The House

Your business might be using dual Opteron servers equipped with SuSE Linux Enterprise Server 8 and IBM's DB2 Universal Database. Or maybe you run statistical analysis with Stata 8 software specially ported for 64-bit addressing. Either way, the uses for AMD's latest technology are highly specialized. There's not a lot of selection, and those apps that do exist are very much work-related. What role, then, does 64-bit computing play in your home?

It may surprise you to hear that AMD doesn't expect immediate 64-bit migration. Simply, there aren't many desktop apps capable of pushing the 4GB memory limitation, and even if there were, none of the apps currently available are intended for general consumption. But because Athlon 64 features twice as many registers and complex math in 64-bit mode, AMD anticipates codecs, simulators, compression algorithms, encryption schemes, and games all have a future in 64-bit computing.

"AMD knows that it needs games, Internet content-creation apps, and video-editing software to compel home users," says AMD Fellow Richard Brunner. "Without them, we'll lose. We are working with all of the big names to expose the benefits of AMD64 on the desktop."

AMD has already demonstrated Unreal Tournament 2003 running on a 64-bit platform, and Epic's Tim Sweeny anticipates a 64-bit beta patch will emerge shortly after Athlon 64 hits store shelves. "Performance on AMD64 will be great," Sweeny says. "But don't expect a big difference in performance when running in 64-bit mode vs. 32-bit mode. For UT2003, this is primarily a 'Look, it works!' sort of release."

Perhaps more data-intensive apps, such as video editing, will enable a more tangible gain.

32-bit programs on 64-bit OSes to ensure they operate symbiotically.

64-bit: Areas Of Expertise

It's important to realize that not every piece of software will emerge as a 64-bit title. The main reason to port an app to AMD64 is if it would benefit from the increased virtual and physical address space, according to AMD's own white papers.

Several heavy-duty enterprise apps have already made the transition. IBM's DB2 Universal Database is one, and Oracle's 9i enterprise database is another. Other titles offer Web serving, distributed computing management, yield analysis, and parallel debugging; it's not exactly a list rife with productivity apps and antivirus software, is it?

Although it may be true that AMD's push for 64-bit software development has yet to turn out a plethora of desktop apps, AMD believes its initiative is an evolving process, drawing parallels to Intel's 386. In a presentation at ClusterWorld Conference & Expo in June, AMD's Brunner said, "The transition will occur at the pace of demand for its benefits." According to the presentation, the 386 successfully established 32-bit computing, concurrently endowing early adopters with the best 16-bit performance as well. OS and app development took time; the same will hold true for the move to 64-bit.

When desktop software does emerge, AMD anticipates 3D graphics, animation, and digital content creation will benefit the most. Codecs, encryption schemes, compression algorithms, and games may also demonstrate an improvement via the added registers and more complex math. Meanwhile, AMD continues to provide software developers with tools needed to work with the AMD64 ISA.

Developers Do 64-bit

Game development is one area where 64-bit capabilities promise to make a profound impact. A presentation by AMD's Mike Wall at Game Developers Conference GDC 2003 highlights a few of the most significant points, including faster compilation time for games, faster modeling, animation, and rendering.

"Because of our new content tools, we're already feeling a very strong need for 64-bit internally right now," says Epic's Tim Sweeny. "And by year's end, I expect we'll look at 64-bit as something that we couldn't possibly do our jobs without. We expect this sentiment to carry over to other game developers in the next 12 months, to high-end consumers over the next 24 months, and the wide mainstream all the way down to the lowest end of the market within 36 months. So, overall, we've found 32-bit adequate for prototyping new content, but serious development will only be possible with 64-bit." Valve Software is also backing AMD64 with a 64-bit build of its Counter-Strike server, available immediately. According to Valve, the new build runs as much as 30% faster than the 32-bit version.

To accelerate the development process Epic and Valve are tackling, AMD has published a complete resource kit, including documentation, a 400-page software optimization guide, a core math library, and a performance analyzer capable of

AMD's Infrastructure Partners

Reportedly, several 64-bit apps are in development, but AMD can't name names until they are ready for prime time. Here are a few of AMD's infrastructure partners, however, that have already committed to AMD64.

Windows OS: Microsoft (currently developing a 64-bit extension to the Windows OS, now in beta)

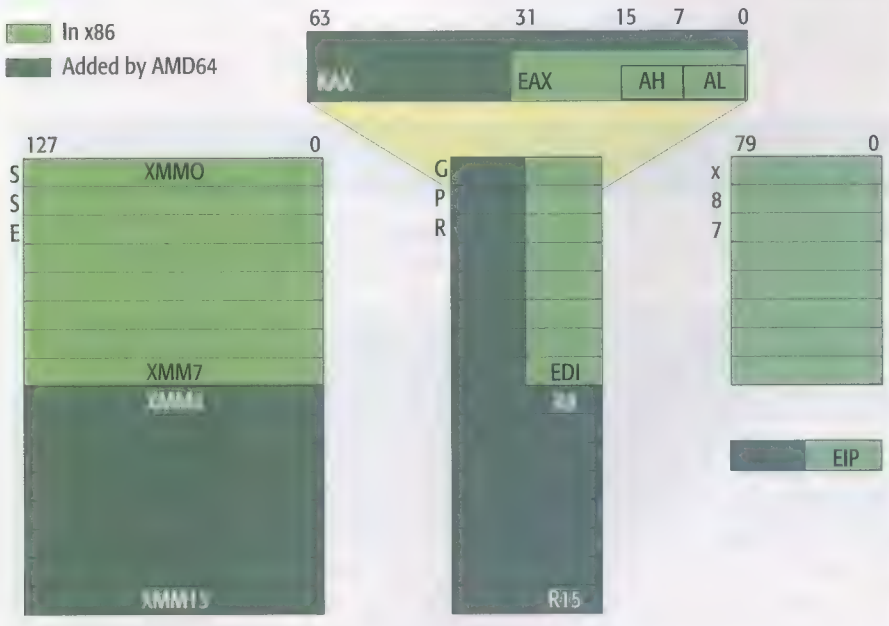
Enterprise database: Computer Associates, IBM, and OSA Technologies

Linux OS: Caldera, Red Hat, SuSE, UnitedLinux, and Wasabi

Web server: Apache, Zeus, and Red Hat StrongHold

eSecurity: RSA

Tool vendors: AMD Core Math Libraries, Atlas, GNU, Blackdown Java, Perl, MPICH, Compuware, Etnus, Grammar Engine, MigraTEC, NAG, Pallas GmbH, PGI, Scyld Computing, and STMicroelectronics



AMD64 includes provisions for eight extra GPRs (general-purpose manager) and eight additional XMM (extended memory manager) registers. (Source: AMD)

simulating and profiling software performance. It also references third-party tools, from Win32/Linux compilers to proprietary development platforms for device drivers to open-source Linux profilers.

Patiently Waiting

If you look at AMD's 64-bit initiative as a glass of water, it could appear either half empty or half full. On one hand, the most highly touted feature of Athlon 64's architecture is, for the most part, unexposed. There are a limited number of uses for 64-bit computing in a desktop environment, and even if there were more, who says software developers would readily adopt AMD's vision?

That's a dismally pessimistic point of view, and the Athlon 64 is more than just 64-bit computing. Its updated architecture offers immediate gratification to performance enthusiasts who will undoubtedly compare it to the P4 in 32-bit benchmarks. And of course, the ability to migrate to a 64-bit OS in the future carries merit. Early Opteron adopters are recognizing the value of buying a 64-bit server that costs less than $25,000. As that technology propagates down into the mainstream, Athlon 64 will also become more attractive.

Furthermore, AMD has secured endorsements from a fair number of hardware vendors and software developers. Even Microsoft is committed to backing AMD64. Yet those who expected a library of 64-bit software are now wondering what to do with Athlon 64. AMD's message is that you can do anything you would have done with an Athlon XP, only faster. AMD knows its eighth-generation chip is plenty fast, but Athlon 64's redeeming characteristic will have to be a robust foundation of 64-bit desktop apps that exhibit a tangible performance improvement.

"When can we expect that?" you ask. In the words of Juba from "Gladiator," ". . . soon, but not yet. Not yet." CPU

by Chris Angelini

64-bit In The Home

AMD believes the following apps stand to benefit the most from its architecture, once 64-bit becomes a viable option in the home.

- 3D gaming
- Codecs
- Compression algorithms
- Encryption
- Internet content serving
- Rendering

Opening Up Opteron

AMD hopes that Opteron will build on the relative success of its Athlon MP processor. Though the two architectures are fundamentally similar, there are distinct differences between the flagships from each family. (Source: AMD)

	Athlon MP 2800+	Opteron Model 246
Operating frequency	2.13GHz	2GHz
Pin count	462	940
Manufacturing process	130nm	130nm SOI
Transistors	54.3 million	105.9 million
Die size	101mm²	193mm²
L1 cache	128KB	128KB
L2 cache	512KB	1MB
Packaging	OPGA	Ceramic µPGA
Price per 1,000 units	$230	$794

Getting Along In Athlon 64

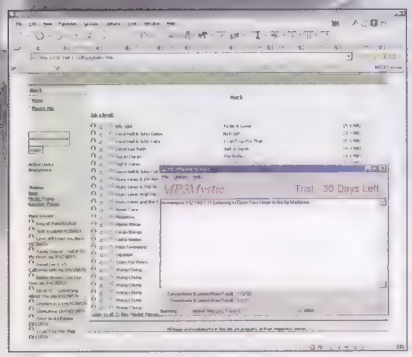
Athlon 64 is capable of running in any number of modes, depending on its complimentary software package. This chart depicts the various combinations of OSes, drivers, and apps that can run concurrently on Athlon 64. (Source: AMD)

	Operating Mode	OS Required	Application Recompile Required	Defaults		Register Extensions	Typical GPR Width
				Address Size (bits)	Operand Size (bits)		
Long Mode	64-bit Mode	New 64-bit OS	Yes	64	32	Yes	64
	Compatibility Mode		No	32		No	32
				16	16		16
Legacy Mode	Protected Mode	Legacy 32-bit OS	No	32	32	No	32
				16	16		
	Virtual-8086 Mode			16	16		16
	Real Mode	Legacy 16-bit OS					

by Warren Ernst

The Bleeding Edge Of Software

Inside The World Of Betas



Official product name: MP3Mystic
Version # previewed: 1.08b5
Publisher: Jason Rahaim
Developer and URL: Jason Rahaim; www.mp3mystic.com
ETA: Q4 2003
Why you should care: The coolest way to share your (legal) MP3 library.

MP3Mystic 1.08b5

MP3Mystic rates a 9.5 on my "cool stuff o-meter," but will anyone really ever use it? I'm still undecided on that.

MP3M is a personal MP3 streaming server. Basically, you run it, point it to the folder that contains your MP3 library, and then point your Web browser to the IP address where MP3M is running. Immediately, you'll see a brilliant interface listing your MP3 songs with lots of options and commands. MP3M knows all the ID3 tags your songs possess and can search and filter them based on genre, age, artist, title, or pretty much any word you like.

Next to each song are three icons that let you listen to the song, download the song, or add it to your online playlist. Playing the playlist, or the song itself, will start streaming the MP3 file to your default MP3 player. (I found this works best with Winamp.) The interface and feature set are most impressive.

For personal use, where only one person at a time can access the songs, MP3M is free. The intended use here may be to access your home-based MP3 library at work or from another computer in another room in the house. The problem is that you would probably use an iPod or a simple networked drive and Winamp in these situations. But that wouldn't be nearly as cool.

The Commercial version (a bargain at only $30) of the app can stream as much music to as many people as your bandwidth will allow, which seems to be a pretty good way to get sued by the RIAA. At any rate, should you want to broadcast music to hundreds of users, there are tools for limiting IP access, managing uploads, and making custom themes for your listeners, which will make your library even cooler.

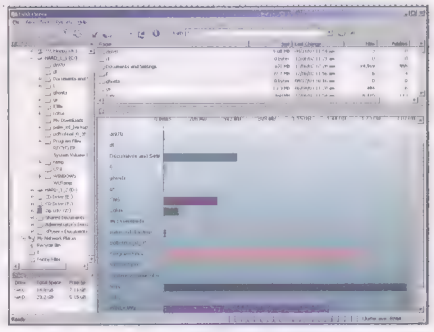
FolderSizes 1.0 beta 3

Don't you hate knowing how much space you *don't* have on your hard drives? That 80GB drive you installed last year was huge then, but now you can't scrounge up a measly 4GB to convert a video file. Windows Explorer isn't much help because, at best, it can display folder sizes one at a time. There must be a better way. Well, there is in the freeware form of FolderSizes, a stable 1.0 beta 3.

FS scans your drives and provides space-usage information via graphs and reports. After the scans, you can dive through your drives and folders, and folder-sized graphs appear instantly. With these, it's simple to see where all your free space has gone. You can then delete older or temporary files. Because the sizes are shown relative to each other, locating the grossest offenders takes seconds instead of minutes (or longer).

Reports include the Top 50 Largest Files, Oldest Files, All Files By Format, and Temporary Files. Some are more helpful than others. For example, the Temporary Files report lists files in any directory with the word "temp" in it, including any you may have made on the fly and don't want included. The Top 50 Largest Files really helps locate the files you probably should have deleted last month, though. A right-click of any file lets you delete, rename, copy, and more.

Why Microsoft didn't include similar functionality in Windows, I don't know.



Official product name: FolderSizes
Version # previewed: 1.0 beta 3
Publisher: Key Metric Software
Developer and URL: Key Metric Software; www.foldersizes.com
ETA: Q4 2003
Why you should care: FolderSizes is a great way to locate those huge blocks of wasted space.

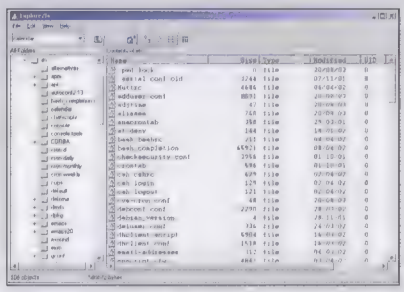
Explore2fs 1.00 pre 6

Many of us know that if you're using a dual-boot system with Linux and Windows and you're running Linux, you can still mount and access files on the Windows partition. (Check out the documentation in your /etc/fstab file.) "Too bad Windows can't do the same," you may be thinking. Well, wish no more because there's a program called Explore-2fs for Windows that's almost as good. Though it's not a complete mountable external file system for Windows, E2fs is the next best thing.

E2fs essentially is a Windows Explorer-like program that knows how to read Linux ex2fs and ex3fs formatted drive partitions. The app displays the folders within those partitions on the left side of the program window. Selecting a folder displays its contents on the right side of the window. Double-clicking a file will attempt to open the file based in its file extension. You can right-click the file and choose View from the context menu to load the file into the text editor of your choice. Saving that opened file to a Windows partition copies it, though dragging and dropping also works.

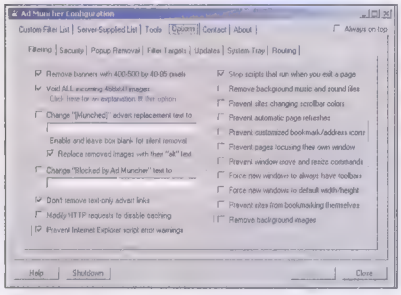
If you're feeling brave and have a complete backup of your Linux partitions, E2fs' author suggests trying to enable write support. This lets you edit files and save them back into your Linux drives. On some systems, though, this has been known to completely trash partitions. However, this process worked just fine for me.

E2fs has been in development for a few years, and bugs have been squashed at a relatively casual pace. Correcting an issue where E2fs couldn't read partitions that had been touched by PartitionMagic (a big problem for me) took the longest time, but apparently if you use Windows NT/2000/XP, the problem has been fixed. PartitionMagic notwithstanding, E2fs also works in Windows 9x and is a godsend for those times when you just need to quickly look at one of your Linux files.



Official product name: Explore2fs
Version # previewed: 1.00 pre 6
Publisher: John Newbigin
Developer and URL: John Newbigin; uranus.it.swin.edu.au/~jn/linux/explore2fs.htm
ETA: Unknown
Why you should care: There's no easier way to read (and write) Linux partitions from Windows.

Ad Muncher 4.51 Beta



Official product name: Ad Muncher
Version # previewed: 4.51 Beta
Publisher: Murray Hurps
Developer and URL: Murray Hurps; www.admuncher.com
ETA: Q4 2003
Why you should care: Possibly the best pop-up ad stopper available.

Most pop-up killer programs aren't very smart and force you to make exceptions for those times when you actually want to see a pop-up window. Ad Muncher, on the other hand, is simply brilliant at killing only the annoying pop-up browser windows that can plague your browsing experience. Additionally, as its name suggests, Ad Muncher kills nearly all banner ads, plus much more.

Ad Muncher gets its smarts from its ability to "phone home" periodically to get an updated list of pop-up sources, such as sites known to pop up ads or server names of ad-graphics sources. The app filters these out before your operating system or browser has a chance to do anything with them. You can also add or remove sources yourself.

Banner ads, be they GIFs, Flash animations, or new technology, get filtered out, too, and are usually replaced with a "MUNCHED" text string. The app can manage this because it acts like a proxy server (but it isn't) between any Internet program and the Internet itself, looking for advertising code in the raw TCP/IP stream and intercepting the incoming ad and replacing it with something else. This also has the effect of removing ads from instant messengers, P2P file-sharing apps, email clients, and IRC clients.

Ad Muncher has lots of other nice features, too. There's an Anonymizer that automatically bounces your connections through many public proxy servers, effectively masking your IP address. There's also a built-in IRC client to chat with other Ad Muncher users. The entire program was written in assembly language, so it is lightning fast and almost unbelievably small. All this great functionality actually makes it worth the $25 asking price.

Send Us Your Betas: Know of software in the beta stage that's deserving of some attention? Let us know. We'll take a look at it and possibly give it a go-round. Send your prospects to bleedingedge@cpumag.com.

UP TO SPEED

Upgrades That'll Keep You Humming Along

A smorgasbord of program updates is on the menu this month. You can dine on new DVD Audio capabilities in WinDVD or on bug fixes in a PowerDVD patch. Owners of Sony DVD burners or Western Digital hard drives also will want to check out new and updated utilities, and DivX codec fans will want the new 5.1 software.

Upgrades

Advanced Web Ranking 2.0

This utility for Webmasters tracks your Web site's rank in search results at the major search engines and charts progress over time. Version 2.0 includes more reporting tools for publishing ranking reports in PDF and other formats. 2.0 also automatically updates its search engine queries so the ranking engine stays apprised of changes in how various search sites execute queries and rankings.

Get it at: www.advancedwebranking.com

Creative MediaSource 1.01.09

This update to Creative's audio player software for the Audigy 2 brings all product versions up to date with all patches and additions released since December 2002. Additions include an Erase CD command, better drag-and-drop file manipulation between MediaSource and other Windows programs, and 24-bit audio playback under Windows XP SP1. Numerous fixes tighten up CD recording, shut down times, and file-format compatibility.

Get it at: www.creative.com

Creative PC-CAM 600/750 Driver Update

If your Windows PC is having trouble detecting the Creative PC-CAM models 600 or 750, this update aims to fix that.

Get it at: www.creative.com

CyberLink PowerDVD 5.0 Patch

This software DVD player gets some bug fixes in this patch, including repairing earlier problems with audio glitches with SPDIF and VCD playback and aspect ratio in DivX clips. Digital zoom now works while playback is paused, and the program handles skin changes better and recognizes removable DVD-RAM drives.

Get it at: www.gocyberlink.com

DivX 5.1

This video codec gets a substantial refresh here with many bug fixes and 10% to 30% faster operation on most CPUs. The interface has been streamlined, and backward compatibility with DivX 3.0 is improved. DivX also has a new "high quality psychovisual mode." We don't know what "psychovisual" is, either.

Get it at: www.divx.com

InterVideo WinDVD DVD Audio Pack

This $39.95 optional add-on for the WinDVD 5 Platinum and Gold editions lets users exploit the DVD Audio functions of Creative's Audigy 2 audio cards. Users can navigate and play DVD Audio discs and view any embedded video clips available on some of these discs.

Get it at: www.intervideo.com

Paessler IE Booster 2.1

This Internet Explorer add-on lets you drill into the HTML and script of a Web site's source code, copy site content, analyze link structures, and more. This version puts its own toolbar into IE.

Get it at: www.paessler.com

Sony DSS 1.0

Specifically for use with Sony multi-format DVD writer models DRU-510A and DRX-510UL, the Drive Speed Selector lets users optimize the write speed.

Get it at: sony.storagesupport.com

Western Digital Data Lifeguard Tools 10.0

This suite of diagnostics and troubleshooting utilities works on WD's EIDE line of hard drives. The tools can test for errors and potential problems, fix some errors, and scan for bad sectors. This version is certified for all WD model numbers, supports drive-to-drive copying with NTFS-formatted drives, and includes a new interface.

Get it at: www.wdc.com

Driver Bay

NVIDIA ForceWare 5.0

Goodbye Detonators, hello ForceWare. NVIDIA rebrands and expands its approach to graphics driver updates for the GeForce line with this suite aimed at optimizing its GPUs under different conditions. The Optimized Code Generator lets developers write optimized code paths specific to AMD or Intel processors and chipsets. The CineFX 2.0 function is designed to handle more advanced vertex and pixel processing, plus shadow handling from multiple light sources (Doom III). IntelliSample HTC adds more powerful compression algorithms and better anti-aliasing and anisotropic filtering.

Get it at: www.nvidia.com

VIA DriveStation V-RAID Serial ATA 2.02

This updated SATA RAID driver is specifically for motherboards with the VT8237 southbridge, which includes most models based on the KT600 chipset. These drivers enable RAID 0, 1, and 1+0 modes and include a full package of RAID setup and monitoring utilities.

Get it at: www.viaarena.com

VIA Hyperion 4-in-1 Drivers 4.49

This is the latest update of the driver set for most AMD motherboards, including AGP, IDE bus master, updated Windows hardware INF files, and USB drivers.

Get it at: www.viaarena.com

by Steve Smith

LindowsOS 4.0

The Linux-Made-Easy OS Makes Progress

Mention LindowsOS to any Linux geek and she's likely to respond, "That's not a real distro." LindowsOS may suffer from a lack of respect in the Linux community, but the latest incarnation shows that it is turning into a viable operating system. LindowsOS aims for budget-minded buyers who want an easy-to-use operating system but don't want to pay the overhead for Microsoft Windows, which can add $200 to the price of a PC.

LindowsOS 4.0 presents a colorful, intuitive interface that's complete with a launch menu, control panels, and other graphical elements that should be familiar to any computer user. Underneath, the OS is all Linux; it's based on the popular Debian distribution, which is a double-edged sword.

Installation is painless and takes just minutes, but LindowsOS doesn't work with NTFS, so you can't dual-boot with Windows without third-party partitioning software. The first time you run LindowsOS, it starts you off with a genuinely helpful multimedia tutorial that can help you get your bearings. A few minutes with the tutorial can make the transition from Windows easier.

Support for USB devices has been improved since version 3.0, but LindowsOS' peripheral support remains spotty. In my tests, LindowsOS could print to only one of two printers. It also underestimated the maximum resolution and refresh rate of the monitor and was unable to format a Zip disk, although it could read and write to a preformatted disk.

The cable modem connection worked out of the box, but my wireless networking card wasn't supported. For dial-up users, LindowsOS supports most ISPs as long as you have an external modem or an internal hardware modem. (Software-powered "Winmodems" won't work.) Many of these limitations aren't specific to LindowsOS, however. They are issues with Linux in general; glitches that typical Linux geeks might be able to work around, but LindowsOS' intended audience probably won't be able to.

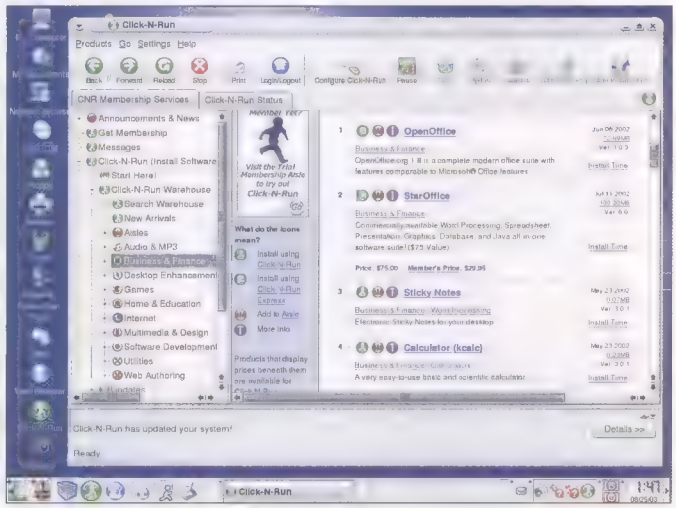
LindowsOS costs $49.95 to download or $59.95 for the boxed version, which includes two CDs. That's certainly much cheaper than Windows XP, but the add-on software could keep your wallet open. LindowsOS comes preinstalled with very little software: there's a Web browser, email client, text editor, MP3 player, and a handful of other basic applications. If you want to download images from your digital camera, use an office suite, play streaming media files, or do much of anything, you'll need additional applications. Users with a little Linux savvy can use APT, the Debian package-management utility, to download and install software; it's easy and free. Lindows.com offers two official solutions: software CDs and the Click-N-Run software download service.

The Click-N-Run service, which costs $4.95 per month or $49.95 a year, lets you select from more than 1,800 open-source applications in categorized lists, downloading and installing the ones you want automatically. The process is smooth; my software was ready to use in just minutes. The company also offers software on CD, which could be important for users without a broadband connection. Lindows Plus is a $59.95 CD that contains most of the Click-N-Run catalog. Other add-on CDs include a pop-up ad blocker, antivirus utility, and Web-filtering software.

The package also includes Lindows CD, a version of LindowsOS that boots directly from CD. You can use it to try the operating system before installing it on your hard drive or to turn any PC into a read-only workstation. The company has partnered with TigerDirect and iDot.com to sell Lindows WebStations, $170 computers that, lacking hard drives, boot from a version of LindowsCD to provide a Web browser, word processor, and other basic functions.

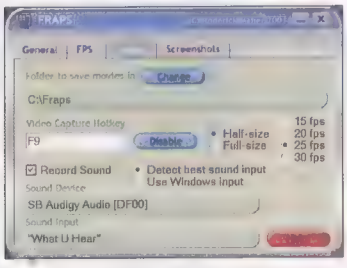
LindowsOS doesn't demand a powerful PC; it works with as little as an 800MHz processor and 128MB of RAM. Although it is still a young OS with its share of problems, LindowsOS is a stable, usable OS that shows real promise as a Windows alternative for the everyman. Users who know how to compile a Linux kernel won't be happy with Lindows, but folks who want a cheaper alternative to Windows or want to send a trial balloon into the world of Linux might be pleased with it.

by Kevin Savetz



LindowsOS 4.0
$49.95, download; $59.95, box
Lindows.com
www.lindows.com

CPU Ranking: 0 = Absolutely Worthless 2.5 = Absolutely Average 5 = Absolutely Perfect



Fraps 2.0

Fraps 2.0
$29.95
Roderick Maher
www.fraps.com

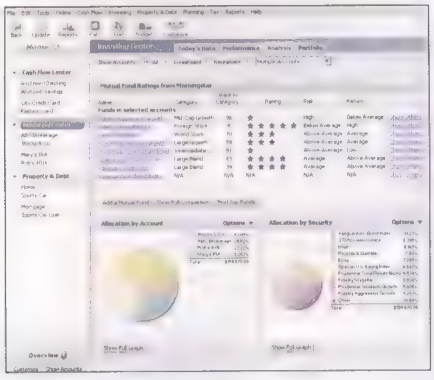
Who in the world really needs a frame-rate counter and video-capture utility for DirectX and OpenGL games? Aside from game site Webmasters, we're not entirely sure, but we're having some fun with Fraps anyway. Once a freeware gadget, Fraps 2.0 is the first retail version of the program, so author Roderick Maher has polished the interface and added some attractive features.

At heart Fraps is a memory-resident program that registers and superimposes the current frame rate of most 3D games. Via hotkeys, users can also start and stop the clock to get an average frame rate for any scene. Fraps did run as advertised within most of the classic 3D engines with which we tested (such as Quake III and Unreal II), as well as recent demos for XIII and Jedi Academy. Still, the actual frame rates raised more questions than they answered. In order to register over 90fps under the Quake III engine, users need to input a special parameter at the game's console. Nevertheless, in some games the counter gave us readings below 30fps, yet to our eyes the frame rate looked as smooth as glass. So it is unclear how the program calculates frames and how this differs from standard benchmarks.

Those who want to capture some of their game action in movies or stills might want to check out Fraps 2.0; it does a very good job of both. Some standard screen-capture programs balk at OpenGL engines especially, but Fraps handles the image capture easily via a hotkey and automatically numbers consecutive grabs. The video-capture utility works quite well and can be calibrated to capture the action at up to 30fps and with audio. The resulting AVI video files can be enormous, however, at more than 160MB for a 10-second hi-res clip, and background recording can cut your in-game frame rate in half.

With some flaws and limited utility, Fraps 2.0 is a fun toy but doesn't seem ready for a $29.95 retail price. Our advice: Download the demo (which limits video capture size and length) and wait to see whether 3.0 offers deeper features. ▲

by Steve Smith



Intuit Quicken Premier 2004

Quicken Premier 2004
$69.95
Intuit
www.intuit.com

After 20 years on the market and a regular schedule of annual updates for at least the last decade, you might wonder what else Intuit could possibly put in this ubiquitous financial manager. In recent iterations, the program included more interactive financial advice, cash flow forecasting, retirement planning, and portfolio management. All of this Quicken continues to do quite well in the 2004 edition. The Premier package is organized much like a browser page with handy navigational links into your Cash Flow Center, Investing Center, and Property and Debt.

With such dizzying power and functionality under the hood, the best thing about Quicken Premier 2004 is that it gets you up to speed faster with an Express Setup feature. Quicken now puts you through a lengthy questionnaire at startup that lets you declare the various ways in which you want to use the program; where your bank and credit card accounts reside; and information about 401(k) plans, house and car loans, etc. Then it holds your hand every step of the way in automating many of these operations in the program. This may strike some users as tedious on the front end, but in practice it effectively had us experimenting with modules such as paying and cash-flow tracking, which we never bothered trying to decipher in earlier versions.

The rest of the world is not always ready to go digital, though, and we still found it difficult to hook into some of our financial institutions online for account updates. We also found it confusing and annoying that Intuit pushes its credit card and bill-paying mechanisms at every turn. This is where we mourn the passing of hard documentation; this sort of program sorely needs it.

For all of Quicken's increasing user friendliness, there is no getting around the fact that personal finance programs require a lot of work up front. We are still years away from having these programs interact seamlessly with our financial institutions online. Once the data is in the program, though, Quicken still shines as a superb tool for tracking and managing personal finances. ▲

by Steve Smith

CPU Ranking: 0 = Absolutely Worthless 2.5 = Absolutely Average 5 = Absolutely Perfect

by Chris Pirillo

Tuning In Alternatives

How many Web sites does Chris Pirillo own? At last count, well over 331,129 of 'em. He buys new ones with the money he makes from recycling tin cans and glass bottles. Some favorites include: Pirillo.com, Lockergnome.com, Rentmychest.com, and Gnomies.com. His biggest domain regret? Not snapping up j89avnre7h.com when it was available. Man, that would've driven killer traffic.

I'm sore, but not in the emotional sense. I began a physical regimen a few weeks ago. Every 48 hours I've been pushing my little body to the limit with routines that cause my muscles to scream, "Whoa, dude! Knock it off!" This has been augmented by bouts of power walking (for an hour or so every day). Sprocket, my faithful pooch, happens to adore the extra attention his legs have been receiving. What does all this mean? This column has finally gone to the dogs.

I finally had a need for an MP3 player, so it was time to do a little virtual shopping. Is portability more valuable than storage space? Do solid-state devices have a chance to win the race? These are questions I had to answer soon because I had my eye on that wonder of wonders (miracle of miracles): the 30GB iPod. Would it work in Windows without MusicMatch Jukebox? You bet, with XPlay, a $30 program from the fine folks at Mediafour. You may remember Mediafour from its flagship product, MacDrive, which enables Windows users to access files and drives made on or for a Macintosh.

Now I've got better things to worry about . . . like how I'm going to return the iPod I recently purchased from a local Apple store.

I'd just as soon not install another media player on my system, especially something as funky and bloated as MMJ. Normally, I'd be content with the Windows Media Player 9 Series, but lately I've found it to be an inflexible memory hog with lousy visualizations (especially when compared directly to a slimmer, cleaner Winamp 2.x). All software aside, Apple's hardware always seems to be leading the pack, in more ways than one. Yeah, there are hundreds of viable alternatives in the field, but I thought I'd stick with my gut instinct this time around. When you need something nice, talk to a thousand geeks to uncover solid (collective) opinions. I couldn't imagine walking into a store and choosing a piece of hardware based on one or two reviews, let alone the advice given to me by an undereducated clerk.

Now I've got better things to worry about . . . like how I'm going to return the iPod I recently purchased from a local Apple store. Normally, I'd rip into an acquisition of such caliber almost immediately, but there were other tasks on my plate that needed to be completed before any fun could be had. No sooner was I ready to dive fingers first into my first true portable entertainment experience than I received a very brief message from one of my Lockergnome subscribers (Thomas McCain). He was telling me about a solution that, had I known existed beforehand, would have stopped me from getting anything but a Creative Nomad Jukebox Zen (the 60GB edition). Thomas raved about a third-party management system that was far-and-away everything I would expect to come bundled with any kind of digital music player.

Red Chair Software's Nomad Explorer ($15; redchairsoftware.com) supports just about every one of Creative's hardware players. Boasting faster transfers than the default software, Windows Explorer shell integration, and a browser-based playlist interface . . . I would have purchased two Nomad's just to use this shareware. It's a great sign when you see that the developers are consistently releasing new versions with greater functionality suggested by their users. Nine clicks out of 10, I'd much rather side with an enthusiast's organization than an authorized development team. The reasons should be obvious.

And don't think you're alone if you've got an Archos. Without fail, I received a message from yet another subscriber (Mark Bright), who told me about Rockbox (an open-source replacement for the Archos Jukebox 5000, 6000, Studio, Recorder, and FM Recorder MP3 players, available from rockbox.haxx.se). You can even load Rockbox directly into the device to give it a quicker boot time.

Is there a perfect product that works well for everybody? No, but if there's software out there that can help you work with the products you already own, then why worry about it? Stick with something that makes you happy, and only upgrade when you know you could and would be happier with the change. Sometimes, all it takes is a little polish, but never expect the official channels to give you what you need. ■

You can dialogue with Chris at chris@cpumag.com.

by Pete Loshin

Spinning The Free Web

Pete Loshin, former technical editor of software reviews for Byte Magazine (print version), consults and writes about computing and the Internet. He also runs www.linuxcookbook.com. He owns shares of both Microsoft and Red Hat and believes that Windows isn't for everyone, but neither is Linux.

This month's column is about how I got my kids' Web site (www.ninitata.com; check it out) up and running with free software. Fortunately for me the Web hosting industry embraces open-source OSes and network services, so I can run all my domains backed by MySQL databases (www.mysql.com), PHP Web scripting (www.php.net), the Geeklog Web portal (www.geeklog.net), and the Apache Web server (httpd.apache.org), all hosted on a computer running FreeBSD (www.freebsd.org). I get half a gigabyte of disk space, 15Gb/month data transfer, phone support, and more all for less than $20/month.

I could install all that software on a server and run it myself—if I had mad skills and tons of time. What's so kewl is that my Web hosting service, Pair Networks (www.pair.com), has the skills and time, so all I had to do was figure out how to twiddle the dials on Geeklog. This blog/community/database-backed Web site program simplifies content management, and it's pretty easy to use once you've figured out where the site graphic files are hidden.

If I decide to do more interesting things with my sites, I feel confident there will be free software available to help.

Geeklog runs on top of PHP and Apache and MySQL, all free software projects that are increasingly indispensable to the Internet business, but none that I need to tinker with at all to make Geeklog work. Just create a database with a few clicks at my Web host company's online control panel, run an install script, fill in a few blanks, and upload my graphics to replace the default banners and icons. And that's it. From there, I enter content and customize the site through the Web site itself.

On top of all this, my Web host offers other useful bits and pieces of software, such as SpamAssassin spam killer (spamassassin.org) mentioned last month, as well as mail-list-management programs procmail and SmartList (www.procmail.org), Web log analysis (Analog; www.analog.cx), and assorted other programs that run at the FreeBSD command line.

It took just minutes (really) to get the site up and running, but that doesn't include site customization. I did have to log into the Pair Web interface for account management and run a secure terminal session with OpenSSH (an open version of the Secure Shell protocol; www.openssh.com). I used a graphical FTP client, gFTP (gftp.seul.org), to upload files, and edited Geeklog config files with emacs (www.gnu.org/software/emacs) in my terminal session.

The result is slick looking, with blogging, polling, news and articles in custom categories, and a links section. My special snail graphic delighted everyone in the family, and my kids immediately started nagging me to add more stories to the site.

If I decide to do more interesting things with my sites, I feel confident there will be free software available to help.

What never ceases to surprise me, though, is the number (and breadth) of cool free things I stumble over as I try to do anything with free software. Did you know there's an Open Source Web Design Web site (www.oswd.org) where you can join a community of Web designers and share templates for Web sites?

Another cool topic, and one I'll come back to next year, is the Semantic Web, where content can be browsed by metadata in the Web, not just the data. To oversimplify, metadata is what differentiates a library search for all works written *by* "Hemingway" from a library search for all works written *about* "Hemingway." Metadata is "data about data," and it lets you specify *what* your data is—a story about kitties or a photographic essay on education or a database of companies that are Linux-friendly, or whatever.

As with the original Web, the Semantic Web has been flourishing largely under the mainstream radar, offered as syndicated content created by everyone from individual bloggers who classify their content so that people can easily snag the information they want to international news sites and other cutting-edge organizations. Check out www.disobey.com/detergent/2002/sw123 for a quirky introduction to the Semantic Web.

Am I totally out of touch with the real world, having given up on all commercial software? Let me know if all the stuff I go gaga over is old hat in the Redmond-centric universe. ■

Get saucy with Pete at pete@cpumag.com.

by Michael Sweet

Words From The Web

YEAH, THEY *ACTUALLY* SAID THIS . . .

From a *CPU* forum post:

People would definitely contribute to a forum if they thought their comments and nickname would be published in a magazine.

We'll expect three posts a day from ya, Totonka.

From a Yahoo! computing chat room:

I never saw a dead . . . I mean . . . corpses, but not like walking dead.

Where in the world do you work?

From an eBay forum post about a system to deal with nonpaying bidders:

It would send jelly-filled donuts through their computer and spurt them out the monitor onto these nonpaying creeps' heads.

A frightening deterrent if ever there was one.

From an MSN chat with Burt Reynolds, regarding what he'd change about his life:

I probably would not have gotten married because I now have the disease Alimonious Streptococcus.

There is no cure.

Election Hero Or Political Zero?

Those crazy cranks who brought you the WeLoveTheIraqiInformationMinister.com Web site now have a new media darling: Arnold Schwarzenegger. The WeLoveArnold.com Web site (www.welovearnold.com) follows the Running Man's attempt to make the seamless transition from movie star to Cali's new czar in the total recall, er, California recall election. The site includes Daily Arnold Updates featuring the latest news regarding the would-be Governator's run for office. There's also a rather lengthy and funny Arnold Speaks section, which includes several Arnold quotes that address an array of political issues. "I'll be back" is not among them.

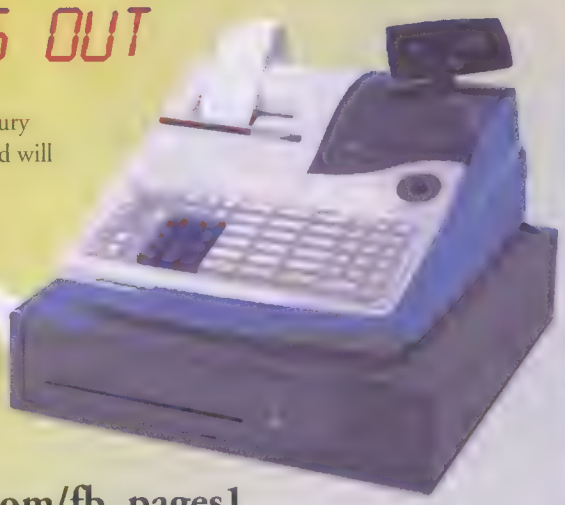
Infinite Loop

Opportunity Knocks, 34.7 Million Miles Away

Mars and Earth swung to within 35 million miles of each other this summer, the closest these planets have been in 73,000 years, offering NASA scientists an unprecedented chance to launch missions in the hopes of finding evidence of life on Mars. Two rovers, Spirit and Opportunity, were shot toward the Red Planet in June and July, respectively, and will reach Mars in January. When they enter orbit, the rovers will use parachutes and airbags to break their falls. Each rover is expected to roam the length of about 10 football fields (perhaps 10 times farther than the 1997 Sojourner rover), all the while using five geologic instruments to look for evidence of life. Because the Martian nights get a bit nippy (157 degrees below 0 Fahrenheit), each rover has a built-in heater to keep its electronics warm.

Sources: CNN, NASA

CHECKING OUT



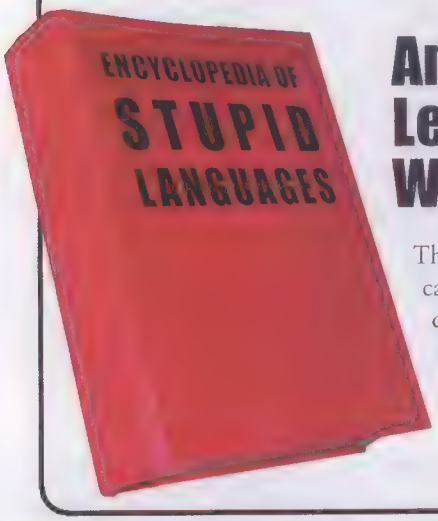
Philosophy and 18th-Century lit. majors around the world will appreciate this online simulation for their first post-collegiate career.

www.fusebox.com/fb_pages1/flash/biz_wiz_game/clerk_final.html

MANUFACTURING 101

The smarties over at Stanford U have put together a pretty slick multimedia Web site that explains how a variety of "everyday things," including motorcycle engines, candy, and denim, are made. You can also check out how various manufacturing processes, such as molding plastics and milling metals, work. The information is interesting, but the presentation is even better.

manufacturing.stanford.edu



And You Thought Learning Klingon Was Lame

The Encyclopedia of Stupid Languages catalogs befuddling and notorious computing languages that have been developed over the years, including Intercal, Befunge, and Java2K.

www.kraml.at/stupid

UNIDENTIFIED Artistic OBJECT

Many people think the UFO era began when a few little gray men made a pit stop in the desert near Roswell, N.M., in 1947. Matthew Hurley begs to differ. He's assembled an online collection of artwork that includes what he believes are depictions of UFOs dating back to pre-historic times. Some of the art definitely has an "X-Files" vibe and is supposed to be inspired by actual UFO sightings throughout history. This is a good site to satisfy your paranormal fix for the day.

www.ufoartwork.com

If you find a strange, interesting, or funny Web site in the course of your Internet travels that you think is worthy of Fringe, send your suggestion to fringe@cpumag.com.

Brilliant Simplicity

PayPal Makes P2P Pay Off

People are the Internet's true killer app. For all of the early dot-com bravado about how the new platform would revolutionize publishing and broadcasting or retailing, the main beneficiary of the World Wide Web is interpersonal communication. Although many companies and their starry-eyed venture capitalists thought the Internet represented magazines and TV on steroids or the world's biggest shopping mall, in fact, this medium may be most like the telephone . . . on steroids. The most successful online apps (email, instant messaging, online matchmaking) are not about helping major corporations speak to people, but more about helping people talk to other people.

Companies such as eBay, Match.com, and Classmates Online rode out the dot-com crash because they understood the Internet as primarily a person-to-person medium. They facilitated people making contact with others. Within this mix of P2P services, one company emerged from a field of wannabes as uniquely successful in enabling two ordinary people to do online what most people do offline everyday: exchange money for goods or services.

The simple genius of PayPal was that it allowed two people to exchange cash virtually, in a secure and anonymous way. This not only opened the doors for an entirely new person-to-person economy online, but it also opened a floodgate of smaller vendors and businesses that couldn't afford to set up costly merchant accounts with the major credit card companies. eBay purchased PayPal in 2002 for $1.5 billion in what was a natural marriage of P2P powerhouses. More than 60% of PayPal's business comes from eBay auction winners making person-to-person payments for goods.

Like parent company eBay, PayPal's vital statistics are a staggering testament to the power of the P2P model online. By the end of June 2003, the company held more than 31 million user accounts, up from 27 million just three months earlier, and it processed $2.8 billion in payments in a single quarter, a rate of $360 a second. Although some financial services companies, such as Citibank's c2it service, and even AOL are launching P2P payment solutions, PayPal has succeeded in thoroughly outdistancing and outliving all major competition.

Boring By Design

For legitimate users, PayPal is as sexy as, well, going to the bank, which is precisely

PayPal gives small businesses that can't afford to take out merchant accounts with the major credit card companies an alternative means for accepting online payments.

the way PayPal likes it. The basic technology behind money transfers is surprisingly mundane. For making eBay payments, still the majority of PayPal business, the two sites connect with a very small data exchange. A Pay Now button on the Auction Item page leads you to a form that contains seller and item information. Only in the last stage of the process, when payment needs to be made, is the user pushed over to the PayPal site where eBay sends along the identity of the seller, the item number, and the description.

One of the appealing things about PayPal is the anonymity it affords: A buyer can pay countless numbers of people and companies without having to distribute her personal credit card or account information to anyone but PayPal. "Being able to have a system that provides anonymity and security has been the secret to PayPal," says Chuck Geiger, chief technology officer. "When you pay me, I have no idea how you paid me. All I know is that my account is credited."

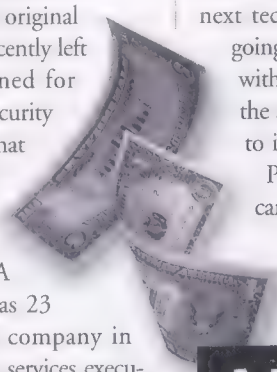
The back end for handling money transfers deliberately follows all the established networks for credit card companies and bank transfers. For bank transfers, PayPal employs the same American Clearing House network as most banks and uses the credit card charge infrastructure established by the credit card associations. "The mantra I try to use is that we use industry-best practices and make life boring for our system and exciting for our functionality," says Geiger. "The front-tier applications run on Linux-based commodity hardware, and the data is all stored in Oracle." PayPal runs hundreds of servers out of two data centers in San Jose and Sacramento. PayPal has grown extremely quickly, so keeping up with both hardware and manpower requirements has been an issue since early in the company's four-year history. Geiger admits the site has had reliability issues in the past, so the architecture is being reworked so that problems are isolated more effectively. Needless to say, the entire PayPal site exists behind what Geiger describes as "an extraordinarily secure infrastructure of firewalls and encryption methods."

The Fraud Police

The overwhelming amount of manpower and technological sophistication within PayPal is aimed at eliminating cheats. "Probably the most innovative aspects of our system are the fraud systems and the way we interact with fraud in real-time," says Geiger. "The total number of employees for customer service and trust and safety are over 800 that just focus on fraud." From

a business perspective, making an online payment system succeed was less a matter of making it easy for consumers than it was about devising ironclad security measures.

Igor. Led by company co-founder Max Levchin, a core of 30 engineers (many of whom remain with the company) wrote and maintained the original PayPal software. Levchin recently left PayPal, but he is renowned for inventing the innovative security and antifraud algorithms that helped the company vault past many well-funded competitors during the Web's precrash years. A cryptographer, Levchin was 23 when he co-founded the company in 1998 with former financial services executive Peter Thiel. The company focused solely on enabling P2P exchanges using the established network of electronic credit card and bank account transfers and making fraud detection job one. But the key was devising a software based, real-time set of algorithms for sniffing out fraudulent uses of the system.



Named Igor after a Russian criminal who PayPal helped catch in 2000, these algorithms are proprietary and written in C++. Their basic function is to check for abnormal activity at a series of checkpoints in a transaction. "Every time you are signing in here," says Geiger, "there are checkpoints based on who you are and who you are trying to send money to and from. It looks at all of that and makes some decisions in the code whether there is a suspect transaction." The process is similar to credit card cheat-detection systems that use a customer's previous purchasing history to flag an exorbitant purchase or a shopping spree as unusual and suspicious.

The human touch. Just as important as the technology is a second, low-tech line of defense against fraud: humans. Whenever the software suspects a cheat, it kicks the transaction out to a human staffer who follows it up by contacting the customers involved. There is also what Geiger calls "near-real-time" monitoring that involves that massive staff of people who are trained in fraud detection. This flesh-and-blood technology examines longer customer histories to establish longer and future trends that are used to flag cheats.

The real technological challenge for PayPal now is to catch up with its own meteoric success with P2P and small-business exchanges and become a viable online payment solution for larger etailers. The next technological step for PayPal is not going to be directed at new functionality within the system because in large part, the sheer simplicity of the system is key to its success. Instead, the next level of PayPal comes in how larger vendors can interact with the payment system. The new project is to build a set of PayPal APIs so partners can write programs and design Web sites that interact with PayPal data via XML transfers. Allowing third parties to integrate their own sites with the PayPal engine is part of the company's grand strategy, to move beyond the small-business vendors and lure bigger brands into using PayPal as its payment system.

The Magic Model

The not-so-secret sauce behind PayPal's winning business strategy online follows a simple recipe: Let the people with the deepest pockets (businesses) pay for the service, and let everyone else use it for free so that tons of new customers do all the viral marketing by getting their buyers to sign on to PayPal, as well. PayPal gets almost all of its

A Job Never Done

Even as it expands internationally, PayPal continues to play catch-up with its own parent company eBay, the demands of larger commercial partners, and now an ambitious expansion plan that will bring the PayPal model into Europe and Asia. Chuck Geiger, chief technology officer, admits that PayPal is in an ever-evolving state.

CPU: How often does PayPal update its software?

Geiger: We introduce functional changes to the site about every month. It's a little more than a month right now, but in 2004 we're going to be in a heartbeat of a monthly push to the site. As we develop more and more functionality with eBay, we need to get on a more monthly schedule.

CPU: How are you protecting against outages and data loss?

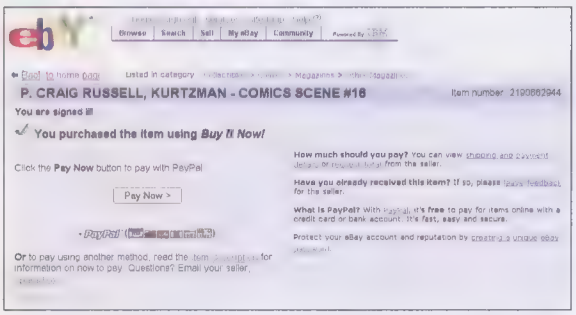
Geiger: We are creating additional disaster recovery capabilities in additional cities around the world actually, so we are working on plans for distributing our systems for better redundancy and lower cost over the globe. We're doing that in conjunction with eBay.

CPU: Has PayPal ever crashed?

Geiger: Historically we have. We've had our share of site issues. We've done a really good job of late to eliminate single points of failure so that if we do encounter small site issues, they are isolated and only cause intermittent outages for pieces of the site. We continue to work on architectural advancements so that we can horizontally and vertically scale all tiers of the application. We have some work to do there, but we're making some great improvements.

CPU: What features are coming next to PayPal?

Geiger: We are expanding internationally. This is the first time we have done this at PayPal, so there is a tremendous amount of work in the systems and applications to be able to provide a cost-effective and scalable system as we go into new countries. We are going to have some fairly significant country expansion over the next several quarters so that we will have local products in all of our local markets. At first we are targeting eBay markets, so we'll be launching in the U.K. and Germany in Q4, and then going after European markets with eBay after that. ▲



Since merging with eBay, PayPal payment buttons now appear on more than 70% of the parent company's auction pages so that now PayPal processes $360 of payments every second

revenue from business accounts, vendors who sell goods and services regularly via PayPal and give the company 2.2% to 2.7% of the purchase price of the goods purchased plus a 30-cent processing fee. Although individuals do keep money on account at PayPal, the company is not a bank and so does not collect interest on any of these funds. The company's financials and prospects looked so good, in fact, that it succeeded in going public in February 2002, the darkest of post-bubble times for any Web-related IPO.

The company's rise to P2P-payment dominance, however, is wholly credited to the magic of network marketing. In its earlier days, PayPal paid users $5 to $10 for getting their friends and customers to sign up, as well. As more individual vendors discovered the ease of collecting payments reliably on the service, they pulled more and more Webizens into the PayPal universe, now at a rate of over 28,000 new accounts a day. Unlike most Web businesses, the company relied on word-of-mouth rather than ad campaigns or inane Super Bowl commercials to build its brand from the grass roots.

Shady Pals?

In part because PayPal is pioneering a wholly new model for exchanging funds, the company has always attracted scrutiny among banking regulators and law enforcement officials. Some of these investigators wondered whom was paying whom, and for what goods and services. And because Pay-Pal enables money transfers between just about any two people, the system has been used in questionable ways. In fact, in 2002, the U.S. Attorney's office charged PayPal with violating the post-9/11 Patriot Act and Wire Wager Act by knowingly allowing payments to and from offshore gambling operations. eBay ended the practice of processing online gambling payments when it took over PayPal officially in October 2002, but until then, PayPal itself acknowledged that it made up to 6% of its income from these transfers. The company agreed to a $10 million settlement.

When it comes to tracking criminals using PayPal to pay for illegal offline activities, "It is a tough one to crack," Geiger admits. "We do have algorithms that look for that. If you move money among multiple accounts, that is sometimes suspect, and the law says we must track it, and everything that is found has to be reported to federal databases."

And because PayPal usually has a user's bank account and credit card info, it is a perennial favorite for scammers. One popular email scam this year spoofs the PayPal logo and return address in order to convince potential victims that their accounts have been placed on hold until they reenter their bank and credit card account information. In addition to educating and assuring users that the company never asks for this information outside of the bounds of the PayPal site itself, the company is defending against these scams by notifying users whenever it seems someone may be tampering with their accounts. PayPal is under frequent assault by hackers, including criminal gangs from Nigeria, Russia, and Indonesia, who have tried to set up fraudulent accounts and use stolen credit card numbers in the system.

Despite its unqualified success, PayPal remains a controversial company among many Webizens. It is in the unenviable position of getting it from both ends: from frauds trying to exploit PayPal technology illegally and from some consumers who complain that the service's antifraud counter-measures are themselves questionable. Protest sites such as www.paypalsucks.com and www.paypalwarning.com actively collect horror stories, complaints, and litigants against the site. Indeed, the art and the peril of PayPal is that it balances two generally incompatible needs of the market for online exchanges: open, easy access so that virtually anyone can set up an account and make or receive payment within minutes, and fraud protection, which has to ensure that these easily made accounts are legitimate and that the exchanges are legal.

PayPal continues to thrive despite pressure from both criminals and consumers. Along with Google and eBay itself, the company is one of the only dot coms to continue to enjoy rampant expansion. Now that it is riding along with eBay, revenues are spiking. In the first quarter of 2003, PayPal went profitable, with revenues up 248% over the same period in 2002, before being bought up by the auction site. In fact, over 70% of eBay auctions now carry the option to pay for an item via PayPal.

While other dot-com success stories such as Amazon.com and eBay itself are settling into comfortable maturity, PayPal is one of the last of the great start-up tales from the Web that isn't even close to leveling off. CPU

by Steve Smith

Infinite Loop

$276 Million Spam

A recent report by Nuclear Research found that spam costs U.S. companies an average of 1.4% lost productivity per year per employee with email. That's about $874 per employee per year, the research firm reckons. Assuming these numbers are accurate, and 100% email penetration, here's how much junk email costs these tech firms:

Microsoft:
54,923 employees = $48,002,702

Sun Microsystems:
35,700 employees = $31,201,800

IBM:
315,889 employees = $276,086,986

Source: Nuclear Research, Microsoft, Sun Microsystems, IBM

www.BenQ.com

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Coder's Corner: XML

XSLT, Part 11:

XSLT Keys & Indexes

In Coder's Corner: XML, Ian Graham shows you how to program with XML. Ian is the author of such books as "The HTML Sourcebook" and "The XML Specification Guide."

In previous articles we've looked at grouping and sorting data from a source XML document using select attributes to select nodes (via an XPath expression); looping mechanisms, such as <xsl:for-each>, to loop over the items in the selected set; and <xsl:sort> to define the ordering of those nodes in the loop. These basics (combined with XPath expressions) provide a complete toolkit for selecting and iteratively processing nodes.

In complex stylesheets, particularly where the stylesheet keeps reprocessing the same set of nodes, it's often easier to move from the original data structure and create a separate index of the nodes. For those familiar with Perl or Java, this is similar to selecting and placing the data in an associative array or hashtable (easy-to-use secondary indexes for looking up and sorting preselected data).

XSLT supports such a mechanism via special XSLT elements and functions. The element <xsl:key> creates a named index containing a defined group of nodes and defines how those nodes are indexed. Indexes are named to distinguish them from each other. A single stylesheet can contain any number of indexes. Once an index is created, the key() function references and retrieves nodes from an index using the specified index key. In a sense, an <xsl:key> is like a sophisticated hashtable; <xsl:key> creates the table, and key() lets you reference items in it with the key value pointing to the node(s) you want.

The XML Data

We'll start with our past list of famous physicists, with a little twist thrown in:

```
<data>
 <item>
   <name>Marie Curie  </name>
   <birthday>7 November 1867</birthday>
   <birthPlace>Warsaw, Poland</birthPlace>
   <favoriteColor>green</favoriteColor>
 </item>
... more items ...
  <a> <b> <c>
  <item>
   <name>Orville Fenderlob </name>
   <favoriteColor>blue</favoriteColor>
   <birthday>6 August 1950</birthday>
  </item>
  </c> </b> </a>
</data>
```

This document contains a sequence of <item> elements, each with information about a famous scientist. The twist is at the document's end, which contains an additional <item> enclosed inside nested <a>, <b>, and <c> elements. This helps illustrate how <xsl:key> creates the index.

Creating A Named Index

The first step is to create the index. We want an index of all <item> elements, and we want to use the value of the favoriteColor element nodes inside the <item> as the key. In short, we want to be able to extract from the index all <item>s that have a particular favorite color value. We create this index using <xsl:key>, which is placed at the start of the stylesheet (before any templates). The markup is:

```
<?xml version="1.0" ?>
<xsl:stylesheet version="1.0"
xmlns:xsl="http://www.w3.org/1999/XSL/Trans
form">
<xsl:output method="html" indent="yes" />

<xsl:key name="byColor" match="item" use=
"favoriteColor" />
```

This creates an index named "byColor." Remember, a stylesheet can contain any number of <xsl:key> elements, each creating a unique (identified by the name) index of nodes. The index's properties are set by the match and use attributes. Match defines (using an XPath pattern expression) the nodes to include in the index. As with <xsl:template> elements, a pattern expression matches to any node in the document for which the pattern is "true."

Thus, the expression match="item" matches to every <item> element in the document, regardless of where they appear.

The "use" attribute of <xsl:key> defines (via an XPath expression) the quantity by which the nodes will be indexed. This expression is evaluated relative to each matched node: Thus, use="favoriteColor" means the matched nodes will be indexed using the <favoriteColor> child element of each matched <item> element. If the XPath expression matches a single node, the index key becomes the node's string value (implicitly converted using the XSLT string() function). For our example, the keys will be the string values of the <favoriteColor> elements—values such as "blue," "green," and so on. Note that white space characters are significant for these values.

Retrieving Data Using key()

Once created, the index is accessed using the XSLT key() function. The following template illustrates how:

```
<xsl:template match="/">
  <html> ....
   <body><p>
   <xsl:for-each
select="key('byColor',
    'blue')" >
       <xsl:value-of select="." />
   </xsl:for-each>
  </p></body></html>
</xsl:template>
```

The <xsl:for-each> uses the key() function to select nodes from the index. The key() function takes two arguments: the name of the index and the value to use as the key when retrieving nodes from the index. In this case, the key value is the string 'blue'. As a result, the node list returned by key() is the set of nodes in the index that have the value 'blue' as their index key.

When applied to our sample data, the output inside the <p> element is:

16 May 1911 blue John Wheeler United States

11 May 1918 blue Richard Feynman New York City, NY, USA everything!

22 September 1791 blue Michael Faraday Newington, Surrey, Great Britain electromagnetism

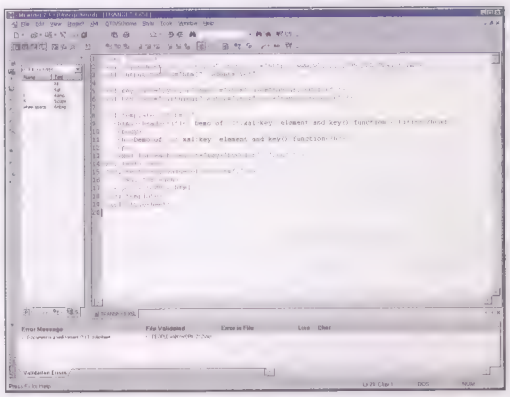
Orville Fenderlob blue 6 August 1950

Note how the index includes information from all <item> elements, including the one nested inside the <a>, <b>, and <c> elements.

Multiple Keys For A Single Node

If use="" in an <xsl:key> matches multiple nodes for a given indexable entry, that indexed node will have (and can be referenced by) multiple keys. For example, suppose the <item> at the end of the data document is changed to:

```
<a> <b> <c><item>
  <name> Orville Fenderlob </name>
  <favoriteColor>blue</favoriteColor>
  <favoriteColor>red</favoriteColor>
  <favoriteColor>orange</favoriteColor>
  <favoriteColor>green</favoriteColor>
  <birthday>6 August 1950</birthday>
</item> </c> </b> </a>
```



This image details one of the XSLT stylesheets as displayed by XMLWriter 2, one of many inexpensive commercial XML editors available. You can download a free 30-day trial version at XMLwriter.net.

Now, use="favoriteColor" references four nodes, with four string values. Consequently, this <item> will be indexed under four different key values: "blue," "red," "orange," and "green."

The key() function behaves like any node list expression. Thus, count(key('byColor', 'blue')) returns the number of nodes referenced by the function, and key('byColor','blue')[2] returns the second node (if there is more than one) in the referenced node list, and so on. However, there's no guarantee of order for the nodes in the index. The node that is at position two in one XSLT engine may be at some other position with another.

Why Bother?

You don't need to use <xsl:key>. You can accomplish nearly every XSLT manipulation with standard loops and XPath expressions. However, keys offer two big advantages: simpler stylesheets and faster processing. The first is often true because creating an index outside templates can make templates that use the index easier to understand, particularly if the expressions selecting nodes for the loop are complicated.

Speed is often a bigger benefit. If you're accessing the same set of nodes many times in the same stylesheet, it's better to create an index. XSLT engines typically optimize indexes for fast retrieval. Indeed, creating an index is much like creating your own in-memory database of XML nodes: The index can take awhile to create but can be blindingly fast to access.

Indexes are commonly used with the generate-id() function for automated construction of links and for sophisticated grouping and sorting of nodes. Next month, we'll look at these advanced features.

XML Editing Tools

Most of the XML documents and stylesheets in this series were created using simple text editors. However, with larger documents or bigger XML projects, it's often convenient to use a richer XML editor that can quickly check for "well-formedness" errors, or consistency with a schema file. Many such editors are available, and most offer downloadable trial versions. If you plan to do a lot of XML work, try some of these more sophisticated tools to see how they can help you become more productive. CPU

by Ian Graham

(Examples of the documents in this article are available at www.utoronto.ca/ian/articles/nov03.)

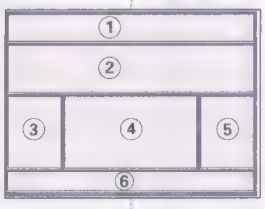
by Lisa Lopuck

Web Page Design Strategies

Lisa Lopuck, www.lopuck.com, is a Web creative consultant helping companies define and plan their Web creative strategy, information flow, and visual look and feel. She is also the author of numerous best-selling books on Web design, including "Web Design for Dummies," and is a sought-after speaker at Web conferences and universities around the world.

After designing Web sites for many years, I've noticed different visual design and navigational trends come and go. Mostly, it's been an evolutionary process to simply find what works best for users. The Web has reached a point today, however, where it's a common tool for the average person, so a certain unwritten lexicon has begun to emerge in terms of Web page design strategies. People tend to look in certain regions of a Web page for specific types of content. This column demystifies these unwritten rules and reveals design strategies that you can use in your own sites.

A Logical Layout



Everything on a Web page must live within a logical grid. Like a newspaper layout, it's fine if a large image cuts across three columns of text; as long as there is a logical underlying grid containing your content, your page will feel organized. See www.celequest.com for an example of an obvious grid. In this site, you can also see how all text and graphical elements line up. If you have three columns of text, the first line of text in each column should start on the same invisible, horizontal line.

People expect to find certain content in different areas of the page. By understanding these content regions of a page and employing good design principles of grid layout, color, animation, and text legibility, you can take control of a user's focus.

Breaking Up A Web Page

In general, you can break a Web page into four rows and three columns. (See illustration.) Each of the numbered areas contains different types of information. Whether a home page or a subpage, area 1 is where people expect to find the company logo, the tag line, the primary navigation, and secondary navigation (such as help and login). Area 2 on a home page is where people expect to find the overview—your main flash animation, benefits, what you do, etc. On a subpage, area 2 is optional. If it is used, it continues the brand look and feel from the home page and is much thinner. Area 2 is where you could concentrate color, graphics, and animation. Areas 3 through 5 on a home page contain news and updated information plus quick links to areas of the site. Area 3 on a subpage is optional. If used, it contains sectional navigation. On a subpage, area 4 contains the page's content, and area 5 is an optional space for contextual links, related info such as tips, and resources. Section 6 always contains the footer information (copyrights, privacy policy, etc.)

Animation Strategies

When using animation or audio, make sure it plays once and stops. Animation is highly effective the first time it plays—users immediately focus their attention on the animation. So animation works best when it's in one spot. Typically, I like to use Flash animation in area 2 that conveys a brand message to give users a sense of what this site or company has to offer.

After viewing the animation, users begin to explore the rest of the page. Incessant animation and audio prevents a user from completing her tour of the page. In addition, it's a good idea to provide an on/off switch for audio. Many users browse from work and do not want to distract co-workers.

Text Legibility

Because people primarily scan Web pages, use as little text as possible. Write copy in an active tense, leading with a verb, such as "Join in the cell phone revolution." Be as concise as possible; condense verbose phrases such as "in order to" to just "to." Use short two-to-three sentence paragraphs, bulleted lists, and subheads to break up content.

For best readability, use sans serif fonts for body text set in 10 to 12 points (size 3 in HTML) and limit your column width to 60 characters. Avoid using italic HTML tags to offset formal names such as book titles. Instead, use bold. Using all caps for short headers is OK, but never for body copy.

Though it may look cool, avoid using white text on a dark background: Reversed-out text is hard to read. Plus, many people print pages, and often their browser is configured to omit the background color to save toner ink, so white text will print blank. ■

You can contact Lisa at lopuck@cpumag.com and see her work at www.lopuck.com.

by Rob "CmdrTaco" Malda

adwords.txt

Rob "CmdrTaco" Malda is the creator and director of the popular News for Nerds Web site Slashdot.org. He spends his time fiddling with electronic gizmos, wandering the 'Net, watching anime, and trying to think of clever lies to put in his bio so that he seems cooler than he actually is.

Advertising on the Internet has always been something of a crapshoot for everyone. For content providers, the end of the dot-com era has caused prices for ads to tumble. Simultaneously, many of the largest ad buyers, the dot coms themselves, have mysteriously vanished, along with their deep marketing budgets. There are now more companies advertising online, but they have smaller budgets, so the sales force must work harder to get those dollars.

For advertisers, it continues to be difficult to determine if you are truly getting value for your dollar. There are many variables to consider, but the most important two factors are the quality of your creative (the actual advertisement) and the targeting of your advertising to the correct content providers. In other words, you need to not only make sure that your ads are appealing, but also that the right people are seeing them.

Bloated ads make the user experience worse, thus decreasing click-through rates and increasing the use of ad-filtering software.

Readers caught in the middle of all this are stuck witnessing the amount of space on the sites we love increasingly transition from content . . . to ads. And worse, the types of ads are shifting. It used to be that the most bloated of advertisements was a simple animated GIF. But these days, the fancy ad types have caused the designers of advertisements to resort to gimmicks in order to draw attention to their advertising. These range from Flash animations providing interactive games, to rollovers, to the most hated of all Web advertising types: the pop-up.

What's ironic is that the more obtrusive advertising gets, the more users will flee to any number of services that strip ads from the sites they love. There are various anonymous forwarding services, local proxy servers, and, of course, browser plug-ins that will strip ads from the Web. For low-bandwidth users for whom advertisements consume 30% to 40% of all their bandwidth, some sort of ad-filtering software isn't just laziness; it's necessary.

Of course this isn't necessarily a bad thing. If a user never clicks a banner ad, there is a reasonable argument that showing any ad to him is simply a waste of an impression. Certainly advertisers are concerned with branding and making sure that the world sees their logos, but in online advertising, the almighty click-through is the only thing that matters.

So the trend in advertising has gone to more ads; bigger ads; and fancy, distracting animation. And the irony is that this makes the user experience worse, thus decreasing click-through rates and increasing the use of ad-filtering software.

But Google found the solution. For years, people have known that the more targeted the ad, the more likely it is to draw a click. The promise of the Internet was to deliver carefully targeted demographics of readers to advertisers. And Google was right there to cash in. A search engine user tells the engine what he wants, so it's a relatively simple matter to make sure that the user is shown a relevant advertisement along with his usual search results.

Google's click-through rates are among the best in the advertising world. The company clearly denotes its advertising as ads, so the sticky conflicts of interest that often plague content sites online are vastly diminished. Google's ads are simple text, meaning modem users are not nearly so prone to banish ads. Everybody wins.

Perhaps most interesting of all is Google's plan to outsource its ad inventory to third-party Web sites. Now Google acts much like a Hollywood talent agency would. It pimps out a huge inventory of very carefully targeted eyeballs. The demographics are ready-made for ad agencies to do a one-stop shop. Their ads will be shown on dozens of sites, but only to users who are interested in the appropriate subject matters.

For advertisers looking to expose their logos to the masses, the text link is somewhat lacking in the pixel department, but I think Google has proven its point already: Simple ads, carefully targeted to the appropriate demographics, are the way of the future. It's so simple, so obvious. And Google is taking this plan all the way to the bank while making content providers, advertisers, and readers all the beneficiaries. ■

Your words of wisdom welcomed at malda@cpumag.com.

by Joan Wood

WhenU Surf

Starting as gopher for the Emmy-winning team that pioneered live in-car TV cameras for the Indy 500, Joan became an independent video/sound engineer, technical director, and producer. Playing with Reality Engines and motion platforms led to co-founding Xatrix Entertainment, where she produced the two Cyberia games. Before 3D acceleration was trendy, she formed Mango Grits to develop hardware-only game Barrage for Activision. Since cashing out from SharkyExtreme.com, where she was co-founder and managing editor, Joan has retired.

News Flash: The Internet isn't a safe place. For most of us, this danger isn't from a pop-up virus or identity theft; it's unwittingly opening the door, and without vigilant surfing habits, your number could well be up. Long gone are the days of the 'Net being free. Your favorite Web site has to pay for bandwidth usage somehow, and as the Internet has morphed from being the world's public library to being an advertising-based business, new and clever ways have been devised to capture those click-through pennies from 'Net-land. It's the American way.

Web sites have to make each page view count for something. They need to generate revenue, user lists, and information, which is worth money to someone. It was only natural for spyware-oriented companies to flock and develop software. Spyware in its worst form is a "hidden" program that may send private information stored on your machine to another one across the Internet. Spyware not only slows your system performance but also gives companies such as eZula (www.ezula.com), WhenU (www.whenu.com), and Gator (www.gator.com) the ability to deliver banner ads based upon your surfing habits—no real harm to you but there is to the site you're visiting in terms of their "stolen" ad revenue. But spyware can also mess with your browser settings and transparently overlay its own banners on top of legitimate ones. The naughtier spyware usually tracks URLs you visit and IP and email addresses you use or send stuff to and then uses this information to force-feed you customized URLs, spam, and advertising banners/pop-up ads. This can get as extreme as fiddling with your search engine requests.

Be especially careful.

Even my Mother knows not to open unsolicited attachments. How long will it take for users to understand that clicking Agree without reading the fine print on the EULA (End User License Agreement) can be just as risky as accepting that EXE attachment from BigBouncySheep.com? Should we outlaw spyware just because most people don't, in practice, actually read the EULA? What if you want the wonderful benefits of "just-in-time" marketing and "precision-targeted" pop-up ads? Or suppose that you do support a particular company absconding with the revenue from your click-throughs because you use their service; maybe that is their revenue model, and maybe you'd like them to stay in business. You might feel even more positive about it if the entity diverting your fraction of a cent were your charity of choice.

It's just that, most of the time, you won't even know it's happening; and worse still, because of the often sneaky tactics, there's an issue of consent. The most common way to be infected stems from users "accepting" (I use this term loosely) the EULA that fools them into thinking that they are doing something that is standard procedure. This actually makes it legal (WhenU just won a lawsuit brought by U-Haul) for companies who get to you via their various pop-up ads, which I've seen people click OK to certify, thinking that they are just getting rid of the pop up. Be especially careful when installing P2P software; even Kazaa, Morpheus, and LimeWire come spiked with some basic spyware.

If you are concerned about spyware, there are ways to set up roadblocks. Make sure you refuse any of those "sneaky" security-warning messages and, yes, read those EULAs. Furthermore, check your browser's ActiveX settings, making sure to choose the Disable radio button under Download Unsigned ActiveX Controls and Initialize And Script ActiveX Controls so they are not marked as safe. This household goes one step further, and now our PCs are not only running virus scanners but also spyware scanners. These programs are mostly shareware and are worth downloading because manually locating and removing spyware isn't easy. Lavasoft's Ad-aware 6.0 (www.lavasoftusa.com) is a particular favorite. Even if you think you are spyware-free, give this utility a try; you might be surprised/disgusted at the results. Your Web experience will not only be a lot more private but also faster, without background spyware slowing things down.

Spyware isn't all bad, but if companies that use deceptive enrolling, sneaky redirect links and search engine requests, and overlay pop-up ads actually have something to offer, why are they hiding? ■

I spy joan@cpumag.com.

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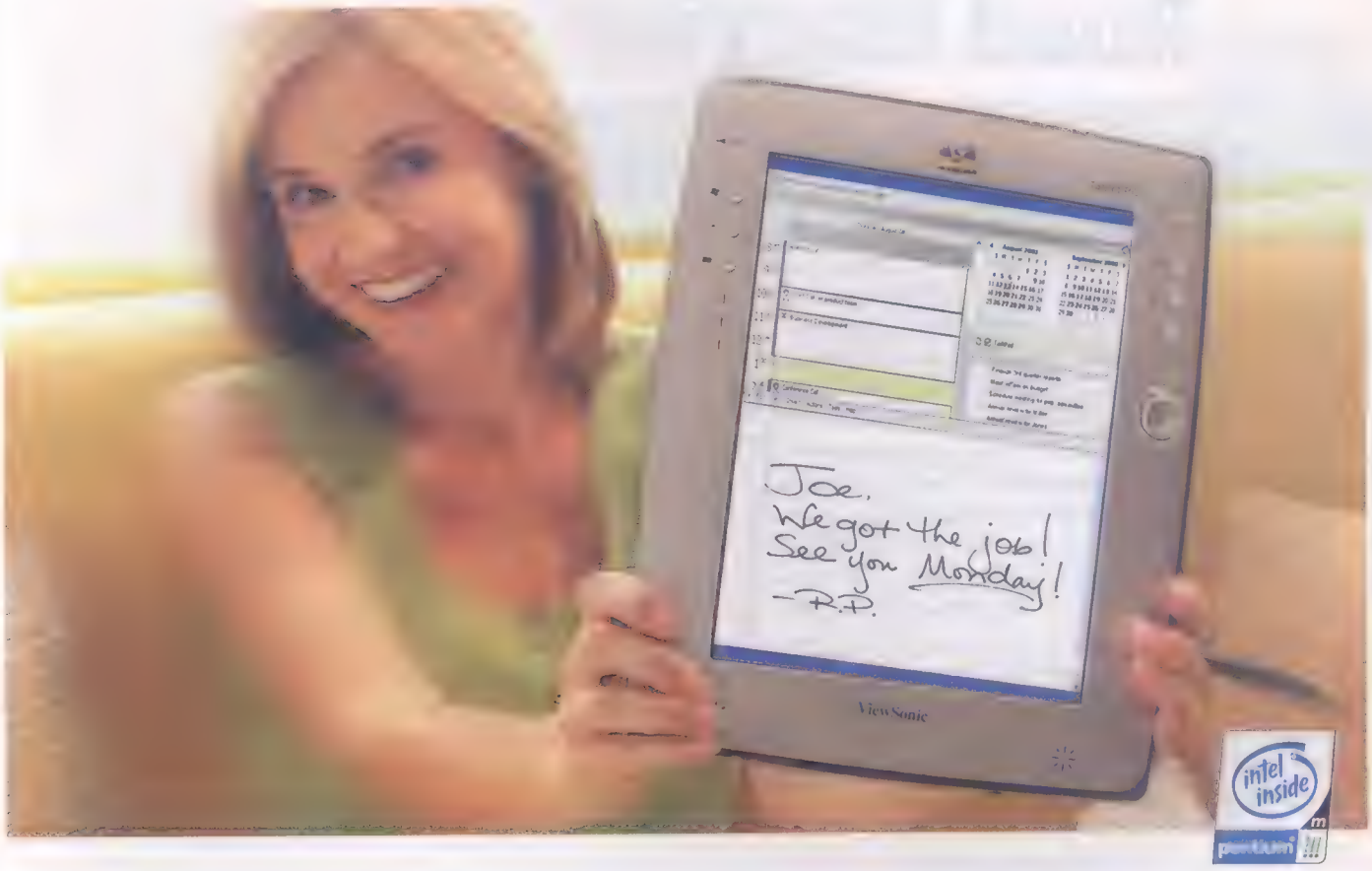

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Freestyle

by Chad Denton

Road Warrior

Palm's New Name, More Number Portability, Verizon Launches PTT Service & More From The Mobile Front

N.Y. Senator To FCC: Help Us

It's not surprising that the August blackout that brought New York City and much of the Northeast United States and Canada to a standstill also caused major telecommunications headaches. Although landline service was often still available to many customers, cell phone users had a harder time making a connection.

In the initial hours following the blackout, cell phone usage skyrocketed, causing network congestion and making it nearly impossible to place a call. Rescue and emergency workers found they had no more priority on most New York City networks than other subscribers, despite the creation of a Wireless Priority Service program following the Sept. 11 attacks. The program aimed to give emergency workers a special code they could use during an emergency to place a call at the head of the queue, making it easier to establish a connection. Participation, however, isn't mandatory, and only T-Mobile currently offers Wireless Priority Service in New York City.

The situation got worse with time. Hours after the blackout, batteries providing temporary power to cell phone towers began to give. Without backup power generators in place, most towers failed, reducing millions of cell phones to really weak flashlights.

In a letter to FCC Chairman Michael Powell, N.Y. Sen. Charles Schumer asked the FCC to ensure rescue workers get priority access when they need it most. Schumer also requested that the FCC make additional demands regarding backup power generators and standards for increasing network capacity.

Camera Phone To The Rescue

In September's *CPU* (page 88) we discussed some rising concerns regarding camera phones and privacy. Although some people are using the devices to do such things as snag indecent locker room shots, others are using them to save lives. Case in point: A 15-year-old New Jersey teen prevented himself from being abducted thanks to his camera phone.

According to news reports, the teen used his camera phone to take pictures of a man attempting to lure him into a car in August. The teen took a picture of the car's license plate and the driver before the driver got out of the car. The teen was able to get free from an ensuing scuffle and board a public bus.

Thanks to the images, police tracked down the driver, William MacDonald, and arrested him on charges of criminal restraint, attempting to lure a minor into a vehicle, and simple assault.

If you're having trouble justifying ditching your old phone and snatching up a pretty new camera phone, this story might help. Who knows, the life you save just might be one of ours.

Picture phones, such as this Sanyo 8100 from Sprint PCS, aren't just good for invading privacy; they're also handy in an emergency. Just ask a New Jersey teen who used his camera phone to prevent his own abduction.

palmOne Is Born

There's a lot currently going on at Palm. In addition to spinning off its PalmSource subsidiary, Palm is also working on finishing its recent acquisition of Handspring. Palm expects to complete the spin-off and acquisition by September or October when it will begin using its new name: palmOne. Devices bearing the palmOne brand are expected in Spring 2004. Other devices will continue to bear the Palm Powered logo. The stock ticker will change from PALM to PLMO, and the soon-to-be-independent PalmSource will trade under the ticker PSRC.

Introducing ZigBee

We're all happy Bluetooth is finally available, but it might not be the perfect solution for everyone. Bluetooth is perfect for mobile devices that require frequent charging, such as PDAs, notebooks, and cell phones, but what about devices that are bothersome to charge on a consistent basis? ZigBee might be the answer.

ZigBee technology builds on top of the physical network layer defined in the IEEE 802.15.4 specification approved this summer. Transmitting at much slower speeds than Bluetooth (a maximum of 250Kbps compared to 1Mbps for Bluetooth) and with a shorter range (less than 33 feet on average), ZigBee and 802.15.4 offers longer battery life. According to the ZigBee Alliance (www.zigbee.org), made up of a group of companies that include Intel and HP, ZigBee devices should be able to last months on a single charge.

ZigBee could be an excellent technology for monitoring remote locations, especially in industrial environments. Battery-operated sensors could report for months on the same battery. Closer to home, the technology could be useful for home automation and may even make its way into some peripherals, such as keyboards and mice. The ZigBee Alliance hopes to see products using the technology in early 2004.

Exactly Like SD, Only One-Third The Size

Secure Digital is gaining in popularity as a removable storage medium; it made major inroads when Palm decided to use the format for storage and removable hardware modules. Cameras, MP3 players, and even notebooks are using SD. The memory format, currently just behind CompactFlash in terms of popularity, is now making a push to conquer the mobile phone market.

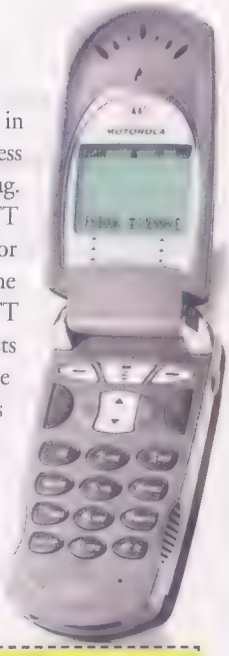
Qualcomm has announced plans to integrate SD into its Mobile Station Modem MSM6100, MSM6250, MSM6275, MSM6300, and MSM6500 chipsets. Phones using the modem will be able to use SD cards for removable storage. With color displays and faster wireless networks, SD cards could store images, music, and even short video clips.

Larger smart phones will use the standard SD format while more traditional mobile phones will use the smaller MiniSD format. The new MiniSD format is more than one-third the size of a typical SD card, but it's compatible with the standard SD format, making it easier to implement in new devices. SD measures roughly 1.26 inches high x 0.94 inches wide x 0.08 inches deep, while the MiniSD format measures just 0.85 inches high x 0.79 inches wide x 0.06 inches deep. Preliminary specifications from SanDisk suggest MiniSD capacities as high as 256MB (compared to 1GB for standard SD).

Verizon Wireless Launches PTT Service

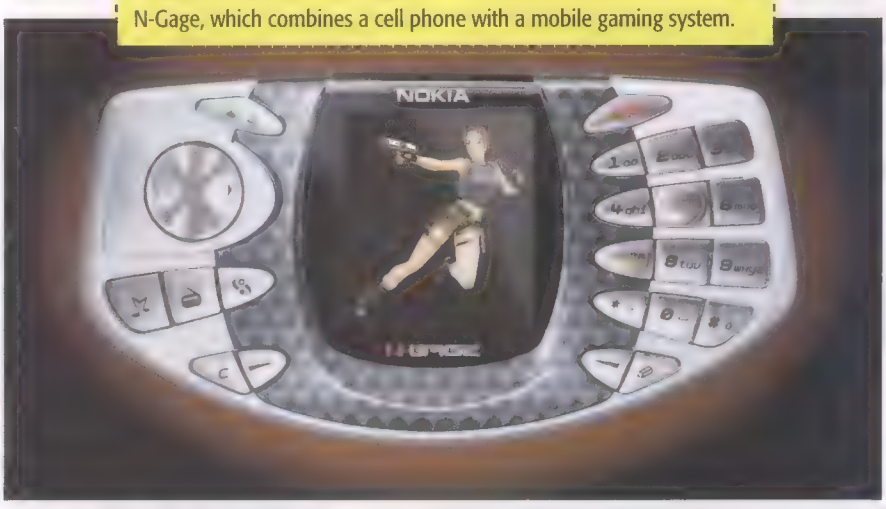
Nextel officially now has some competition in the PTT (push-to-talk) market. Verizon Wireless officially launched its nationwide PTT service Aug. 14. (Sprint PCS expects to launch its own PTT service early next year.) Plans start at $59.99 for 400 anytime minutes with unlimited one-to-one PTT calls. Customers can also make group PTT connections to multiple users. PTT contact lists on the phone clearly indicate which users are available for a PTT connection, and PTT lists are managed online (www.vzwpushtotalk.com/prov/servlet/WmsServlet).

Verizon has made the Motorola V60p available to PTT users for $149.99 with a two-year service contract. The phone is GPS-enabled and can handle up to 500 contacts.



Verizon is offering Motorola's V60p phone in conjunction with its new PTT service. The phone, which includes GPS and comes with a 500-entry address book, is $149.99 with a two-year service contract.

Nokia recently purchased Sega.com in preparation for the launch of its N-Gage, which combines a cell phone with a mobile gaming system.



Nokia Shells Out For Sega.com

In preparation for the October release of its N-Gage, Nokia has purchased the online division of Sega, Sega.com. Sega's online division was one of the first to offer online multiplayer gaming to console owners. Now Nokia will use the network with its cell phone-mobile gaming system, the N-Gage.

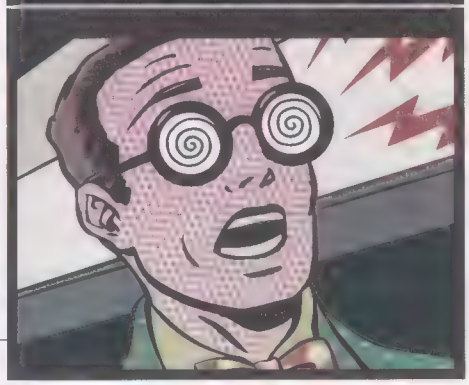
Nokia plans to distribute N-Gage Oct. 7 and sell the device for $299. The N-Gage will include a high-resolution color display, Bluetooth connectivity, and an integrated MP3 player. The gaming system will also double as a mobile phone based on Nokia's Series 60 platform.

Phone Numbers: More Portable Than Ever

We've been following for months now the upcoming FCC mandate that will let customers take their mobile phone number with them when switching services. Recently, the FCC threw a new nut into the trail mix by considering an extension to the current mandate that would let landline users take their current home phone numbers to a wireless service. Naturally, wireless companies are a bit more excited by this possibility, seeing it as an opportunity to steal customers away from traditional landline providers. Technically, however, such a system might be difficult to implement. Landline companies charge according to the distance a call travels, but wireless providers often charge based on the duration of a call. Landline companies maintain that moving a phone number from one system to another is too complicated. The FCC is expected to make an announcement before the Nov. 24 deadline for cell phone number portability.

At Your Leisure

by Samit G. Choudhuri & Chris Trumble



Plug In, Sit Back & Fire Away

The entertainment world, at least where it pertains to technology, morphs, twists, turns, and fires so fast it's hard to keep up. But that's exactly why we love it. For the lowdown on the latest in PC entertainment, DVDs, consoles, and just stuff we love, read on.

Tron 2.0
Enter The *Real* Matrix

Tron 2.0 is based on a movie license. We all know how games based on movies typically stink, right? (Atari's Enter The Matrix tripe springs to mind.) Fortunately, a few hours with Tron 2.0 will dispel any such trepidation. We're delighted to finally find a game that will tide us over while we impatiently await the release of Half-Life 2.

Mercury is voiced by Rebecca Romijn-Stamos.

Monolith, the developers behind Tron 2.0, went back to the 1982 film's sci-fi roots and came up with something conceptually similar in the storyline. The basic premise has you, as Jethro, son of Alan Bradley (voiced by Bruce Boxleitner) being digitized into the world of zeroes and ones. Now inside the computer, Jet slowly figures out why his dad was kidnapped (along with many other surprises) as the plot unfolds. Wow, and what a visual feast the game world is. It really seems like you're in a PC with clever touches flourishing throughout for veteran computer users. Screenshots do not do the artwork and environments justice, but in some ways, the game looks graphically better than the movie.

Gameplay stays true to the "Tron" movie'suniverse. You search for Permissions to help get you through security systems, find your way around firewalls, "derezz" aggressive viruses and ICPs, ride the famous lightcycles (a bit too difficult in single-player mode but fun in multiplayer), and upgrade your weapons and defenses in RPG fashion. At times you may not have a ton of weapons, you'll have to be strategic in outfitting your attack and defensive modules to best suit the situation. If blood and Nazis are your FPS mantra, this might not be your bag. However, for those of you interested in an FPS with solid gameplay with a pleasant twist, look no further than Tron 2.0.

Tron 2.0 (PC)
$49.99 • Buena Vista Interactive
www.tron20.net

DVD Byte by Todd Doogan

The holidays are nearly upon us, and that means there are a whole buncha discs coming out worth plunking down for. We're going to change things around a bit starting with this column: Rather than just reviewing a single title, we'll spotlight some great discs coming to stores this month. First, most of you should add the new **Adventures Of Indiana Jones Collection** to your shelf, as well as the first **Golden Collection** volume of Looney Tunes shorts and **Sopranos Vol. 4**.

All three will be available in the last few days of October. November sees the arrival of many more DVDs, including animated hit **Finding Nemo**, **Legally Blonde 2**, **Star Trek Deep Space 9** and **X-Files** seasons, **Dumb And Dumberer**, a new **JFK Special Edition**, **Terminator 3**, Japan's **Ichi The Killer** from Media Blasters, **Santa Clause 2**, **X-Men 2**, and **Tomb Raider: The Cradle of Life**. All are definitely worth the time and money for DVD fans. Of course, it goes without saying that most of us will be standing in line at the DVD shop waiting impatiently for the four-disc **Lord of the Rings: The Two Towers Platinum Series Special Extended Edition**. You have no choice; it's the only way to gear up for the final installment of Jackson's trilogy due in December. November looks like a huge month for DVD, and those are just the choice picks. There are hundreds more out there just waiting to be saved from the racks.

Soul Calibur II
Fighting Game Perfection, Take Two

Back when the original Soul Calibur hit Sega's Dreamcast console in 1999, pundits widely praised it as the perfect fighting game. The game's successor, Soul Calibur II, is every bit as good (actually, it's a little better), even if it doesn't break any new ground.

Mitsurugi, Voldo, and the rest of the gang are back for another go 'round.

SCII offers all the characters from the original game, plus a couple of new faces

Soul Caliber's Weapon Master mode offers a bit of a story and lets you unlock cool extras.

(Raphael, Talim, and Necrid), and places them in stunning 3D environments so they can beat the stuffing out of each other. If you played the first game much, you'll feel right at home in SCII, as each character's signature moves and basic strengths and weaknesses remain intact. There are a few new moves here and there, and of course each character has a couple of new looks, but the big additions to the Soul Calibur universe are its new guest characters. Each version of SCII has its own guest character: The PS2 version has the crotchety but powerful Heihachi Mishima from Namco's Tekken series, the Xbox version sports comic book tough guy Spawn, and the GameCube version includes Link, the boyish hero from Nintendo's Zelda franchise.

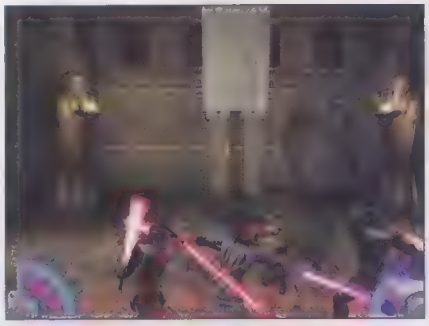
These "new" characters add a pleasing dash of variety to the game, but for our money, the real attraction is SCII's incredible gameplay. There are very few fighting games that offer this addictive blend of over-the-top power and pinpoint precision, and we have the blisters on our D-pad thumbs to prove it. If the game has a weakness, it is that the music, while good, seems to have lost the epic feel it had in the first incarnation. But this is a minor complaint and does little to detract from what is hands-down the best fighting game on the market today.

Soul Calibur II (PS2, Xbox, NGC)
$49.99 • Namco
www.namco.com/games/soulcalibur2

Jedi Knight: Jedi Academy
Lightsaber Combat Evolved

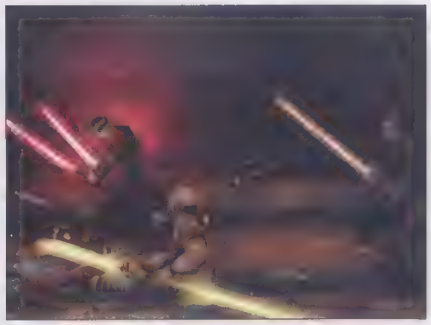
Our primary complaint about Jedi Knight II: Jedi Outcast in spring 2002 was how long the game took before it actually got interesting. After five interminable levels, you, as Kyle Katarn, finally got your hand on the lightsaber. The game actually became really good *if* you managed to stick around long enough to get to that point. LucasArts took the criticism to heart in Jedi Academy. As the game begins, you will choose your race, gender, and lightsaber RPG-style before you, as newbie Jaden Korr, find yourself on a transport to the Jedi Academy to receive instruction under such luminaries as Kyle Katarn and Mark Hamill, er, Luke "Don't Call Me Pansy" Skywalker.

Once again, it's a heavily modified Quake III engine that serves as the graphical backbone for the game, and



You might have fallen asleep in the first five levels of Jedi Knight II: Jedi Outcast, but . . .

it looks good, though not groundbreaking. We're going to steer away from the plot of the story because it is nonlinear and lets you forge your own path for good or evil. Having the choice of going to the dark side is delicious indeed—and allows for greater replayability. As you progress, you will have the opportunity to upgrade your lightsaber and force powers. Fans of the previous Jedi Knight games will recognize most of the armaments. Jedi Academy is mostly evolutionary, and fans of the previous titles will welcome its refinements to gameplay.



. . . LucasArts makes up for it in spades here. Will you fight for good or evil? It's your choice.

Jedi Knight: Jedi Academy (PC, Xbox)
$49.95 • LucasArts
www.lucasarts.com/products/jediacademy

Silent Hill 3
Fright Night

Heather's having a pretty rough day.

Konami recently released the third game in its excellent survival horror series, Silent Hill. In case you're unfamiliar with it, Silent Hill is the name of a non-descript U.S. town where very bad things seem to happen a lot.

Unlike most survival horror games out there, the SH series doesn't rely solely on startling players or the shock value of gore (although you'll get both in spades). The developers go far beyond these methods to create an intensely frightening mood with dark, visceral graphics; disturbing sounds and music; and story lines straight from the mouth of madness. The town of Silent Hill is mostly deserted and creepy enough as it is, but frequently throughout the game you'll find your character slipping out of the "real" world into an alternate Silent Hill that is much darker and scarier.

SH3 continues in the footsteps of its predecessors, forcing players to guide its protagonist, Heather, through a nightmarish tale of forgotten identity and horrible destiny. The game leans heavily on elements introduced in the first installment, including many areas where the only source of light is Heather's flashlight, the use of a mysteriously modified radio that emits static when monsters are near, and a grainy graphical filter that makes Heather's world seem bleak and frightening.

Konami doesn't take many risks with SH3; if you played either or both of the first two titles, you'll pretty much know what to expect from the cursed town of Silent Hill. The good news, however, is that the game is so good and so scary that you'll still find your heart pounding with fear fairly often, and you'll still feel a sense of relief when you escape the dark version of Silent Hill in your occasional returns to the "normal" town.

A grizzled detective named Douglas shows up from time to time to provide bits of information–and more questions.

Silent Hill 3 (PS2)
$49.99 • Konami
www.konami.com/silenthill3

Check These Out On The Web

See our reviews of **NFL Fever 2004** (Xbox), **Downhill Domination** (PS2), and **Flight Simulator 2004: A Century Of Flight** (PC) at www.cpumag.com/nov03/gamereviews.

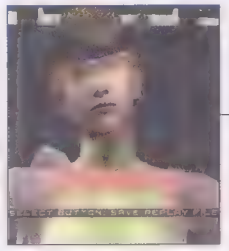
Virtua Fighter 4 Evolution
Wanna Step Outside?

As with any gaming genre, there are fighting games out there for all sorts of players. If you're into hyper-fast, over-the-top action that includes fireballs, magic weapons, and flashy special effects, there are certainly plenty of options for you. (See our review of Soul Calibur II for a look at the best of such games.) But if you're a fan of mostly realistic martial arts and want a game that focuses on real fighting styles, the Virtua Fighter series is for you.

Released in August, Virtua Fighter 4 Evolution is the latest offering from Sega's veteran AM2 development team. The game eschews the button-mashing styles of other titles in favor of a deeper, more complex system that rewards players who take the time to practice and learn. The game isn't all that difficult to begin with, but playing against the CPU's higher difficulty levels and playing skilled human opponents quickly separates the men from the mashers. Each fighter has a huge list of attacks and throws, and several also have some great reversals.

Akira lays down the law.

VF4E offers a cast of 15 selectable characters, including two who weren't even in last year's release of Virtua Fighter 4. You can also take advantage of the game's 10th Anniversary mode and play with retro versions of your favorite VF characters. Despite the new content, though, Sega released VF4E straight to Sony's Greatest Hits collection of $20 PS2 games. At this price, you should consider picking the game up even if you got VF4 last year, and it's a no-brainer if you didn't.



Would a winner really wear a hat like that?

Virtua Fighter 4 Evolution
$19.99 • Sega
www.sega.com

Hot Shots: The Beauty Of The Game

Yeah, we know it's all about the gameplay. Sure, there are those who would have you believe graphics are relatively unimportant in the greater scope of things, but if you read *CPU* mag, you probably already know those folks are off their collective rockers. We want great gameplay combined with stunning graphics, and here are two upcoming games that show promise. Watch for them.

Max Payne 2: The Fall of Max Payne (PC, Xbox, PS2). Violent film noir is back with a vengeance. And this time, with a love story to boot! Other new features are Bullet Time 2.0 and a noticeably improved graphics engine. Take a look at Max's face; that's right—it's a lot more emotive. For more information, check out www.rockstargames.com/maxpayne2.

Lock-On: Modern Air Combat (PC). Who said flight simulators were a dying breed? For more on next-gen air combat, visit www.lo-mac.com.

Infinite Loop

IT Power Ratings

Power rankings aren't just for college football. There are also ratings for "strongest IT nation," for countries with the most robust computer, information, Internet, and social structures that help their citizens readily access and absorb information and information distribution technologies. Can you guess which of the following countries does not belong in a list of the top five IT nations?

- United States
- Denmark
- Sweden
- Japan
- Taiwan

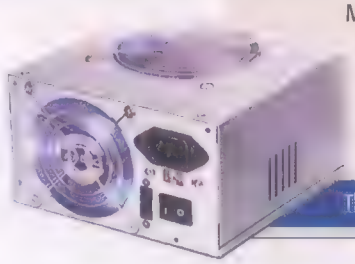
Surprisingly, the United States isn't in the top five, and Japan and Taiwan, home to so much silicon, are also MIA. So who has the strongest IT infrastructure? Sweden. Nearly 70% of Swedes have Internet access (much of that is broadband), and almost 60% have more than three years of Internet experience. In comparison, the United States fell from fourth (in 2002) to eighth in 2003, but our sources say it's too early to expect any abrupt coaching changes.

Sources: IDC/World Times Information Society Index

Modding

Tips & Tutorials

Modding does the body good. A PC's body anyway, inside and out. Here you'll find hardware, firmware, tools, tips, and tutorials for modding your rig's performance and appearance. Send us your own mod-related tips and ideas at modding@cpumag.com.



Three blue LEDs illuminate Antec's TrueBlue power supply

Modding enthusiasts have a penchant for the latest toys. Fast processors, powerful video cards, silent SFF enclosures, and radically lit motherboards are all fair game when it comes to a modder's creative mind. Recognizing the appeal of unconventional customization, an entire industry has emerged to support the community. Performance modding claims seniority, but the aesthetic aspect is expanding with astonishing alacrity. As a result, there are innumerable options for both camps.

Mods & Ends

FrozenCPU.com Antec Modular 480W TrueBlue Power Supply

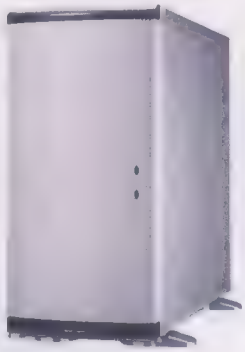
When it comes to performance modding, a reliable power supply is the foundation for platform stability. Antec's TrueBlue 480W unit ($180; www.frozencpu.com) offers dedicated output voltages on the +3.3, +5, and +12V rails, which protects against the adverse effects of loading. Voltage-feedback circuitry lets the power supply test its own output voltages and compensate for a minimal ±3% variance. Three blue LEDs illuminate the TrueBlue, and FrozenCPU.com added the ability to unplug leftover cables, literally making this modular unit one of the neatest we've seen.

Lian-Li PC-6070 Mid-Tower Case

SFF boxes are all the rage, but what if you're a power user with more than a few PCI cards and a SATA RAID array? Check out Lian-Li's PC-6070 ($170; www.lian-li.com), a classier case than its name might suggest. Carbon-fiber accents on the top and bottom are a weight-saving throwback that auto enthusiasts will recognize, and an aluminum door covers the case's entire front fascia. In fact, without the two USB 2.0 ports (cleverly camouflaged in the carbon fiber), the 6070 resembles a futuristic mini-fridge. On the inside, you'll find a sliding motherboard tray, three ball-bearing fans, and removable panels all around. Sound-insulating foam and rubber are also installed in strategic areas.

CoolerGuys.com 80mm Hypno Fan

If your case sports a large window, there's a good chance it can accommodate an 80mm or 120mm cooling fan. Rather than settle for an ordinary cooler, consider CoolerGuys.com's 80mm Hypno Fan ($11). The transparent device features four streaming blue lights and a red centerpiece that fluctuates as the fan spins. The fan moves 30cfm (cubic feet per minute) spinning at 2,500rpm and only produces 25dB of noise. Not a bad way to add a little panache to your rig.



The elegant Lian-Li PC-6070 aluminum case.

Thermalright SLK-900U Socket 478/A Heatsink

You can't go wrong with a reference heatsink—the sort that comes with your Pentium 4 or Athlon XP. Intel and AMD run exhaustive tests to ensure those coolers are top-notch thermal and acoustic performers, but for overclocking, pick up an aftermarket heatsink for the best results. Thermalright's SLK-900U ($50; www.thermalright.com) is at the top of the food chain, constructed entirely of copper with soldered fins. It works with Socket 478 and Socket A processors and accommodates massive 92mm fans for more than 110cfm of airflow.

PCToys.com Breeze Maxx 70mm Personal Cooling Fan

Well-organized LAN parties are great fun, complete with gaming, snacking, and socializing. But unless the venue is well ventilated, heat from a room full of computers becomes oppressive. (Nothing is worse than 20 or 30 sweaty gamers.) That's why PCToys.com developed the Breeze Maxx Fan ($13), a 70mm ball bearing fan that powers off batteries or a USB port. At its slowest setting, the Breeze Maxx pushes 20cfm and generates 25dB of noise. The 3,200rpm setting is slightly louder, though it manages 27cfm. The Breeze Maxx won't replace your desktop fan, but it offers a nice breeze at a LAN party.

Fashionably Fresh Firmware

Pioneer DVR-A06, DVR-106

This 1.06 update improves 4X DVD-R writes, 2X DVD-RW writes, DVD-RW reads, and enhances the drive's DRT-DM(Distributed Real Time Defect Management) capabilities.

wwwbsc.pioneer.co.jp/product-e/ibs/device_e/dev00001r_e.html

D-Link DCS-2000 Internet Camera

Slower networks will see improved synchronization of audio and video, and VM control and client plug-ins get an upgrade.

www.dlink.com/products/support.asp?pid=142

Belkin 802.11g Wireless DSL/Cable Router (F5D7230-4)

This update brings Belkin's Wireless DSL/Cable router into compliance with 802.11g specs.

web.belkin.com/support/download/download details.asp?file_id=1337

by Chris Angelini

Let's Recap

Repairing Faulty Motherboard Capacitors

IF A CAPACITOR ON A MOTHERBOARD DIES, SOME USERS SIMPLY THROW DOWN THE GREEN AND REPLACE THE MOTHERBOARD. FOR OTHERS, BUDGET CONSTRAINTS MAKE REPLACING A MOTHERBOARD MUCH MORE DIFFICULT.

Luckily, repairing a faulty cap is easier and less expensive than you might think.

Capacitors, or "caps," come in many forms, including ceramic, mica, film, and electrolytic. Each is geared for a specific task. Inside a typical system, you're bound to find myriad caps on virtually every printed circuit board. Odds are you'll see numerous electrolytic caps surrounding the CPU or scattered about the video card. Typically, these electrolytic caps filter the electrical currents traveling throughout the PC's circuits.

Who would have thought that these small, inconspicuous canisters would be the focus of a plot straight out of a James Bond movie? Sort of.

The story, according to multiple sources, goes: In 2001 a scientist stole a formula for an electrolyte from his employer in Japan. Soon thereafter, the scientist went to work for a Taiwanese electrolyte manufacturer where he used the formula for himself. However, the stolen formula was incomplete and crucial additives were missing. Without these additives, hydrogen gas was created when the faulty capacitors were electrically charged. The gas caused the caps to bulge and eventually burst, leaking electrolyte. When the caps failed, whatever circuits they were connected to were also rendered inoperable.

Had it been only one manufacturer using the incomplete formula, the problem probably wouldn't have been widespread. Unfortunately, the formula was sold to at least one other Taiwanese cap manufacturer. Faulty caps found their way onto motherboards produced by a few well-known companies, and last year they began to fail at an alarming rate.

A few enterprising individuals noticed the trend and set up Web sites dedicated to this issue, offering repair services for a fee. Although it's now evident that multiple companies were affected, Abit was the first, and one of the only, to admit there was a problem and offered in-warranty repairs to those who had purchased defective equipment. IBM proactively contacted some customers, offering to repair the components under warranty. Abit and IBM were almost certainly not the only companies affected, but they acknowledge the situation existed and offered potential solutions in mid-to-late 2002.

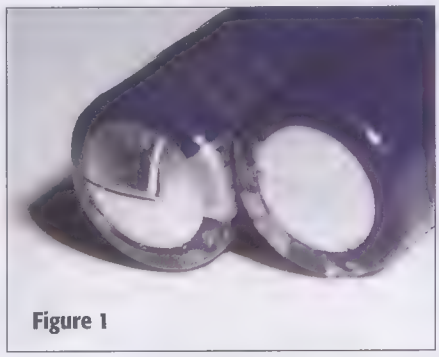


Figure 1

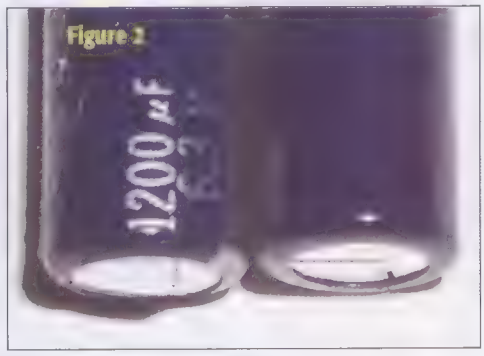


Figure 1 shows two identical 6.3V – 1200 microfarad capacitors. The cap on the left has exploded and leaked electrolyte. The cap on the right is in prefect working order. **Figure 2** shows the same capacitors at a different angle.

What Is A Capacitor?

The *Oxford English Dictionary* defines a capacitor as "a device which stores electricity during part of an operation; a condenser." A cap is made of two or more electrically conductive plates separated by an insulator. The plates are made of materials that can be electrically charged, such as aluminum foil. The insulator can be anything from air to paper. Depending on the construction, caps have maximum voltage ratings and capacitance values, measured in "farads."

The voltage rating is basically the highest voltage the cap can handle for an extended period. The capacitance value is how much of an electrical charge the capacitor can store. A cap has either radial or axial leads, meaning the cap's leads are both at one end of the cap (radial) or one lead is at each end (axial). Electrolytic caps are polarized, so they have negative and positive leads. The negative lead is usually marked by a prominent stripe running the length of the canister. When connecting them in a circuit, the polarity must be correct or the cap could damage the circuit and explode.

Identify The Problem

How can you tell if electrolytic caps have failed or are about to? Without expensive

equipment to test each cap, physical inspection is your best bet. There are a few recognizable outward signs that indicate a cap is on the verge of failure. When looking down at an electrolytic cap, the metal plate at the top will often be scored. The scores let the metal easily break if pressure builds up within the cap, alleviating some force should the capacitor explode. If the plate has bowed and the scored metal has cracked, there's a good chance gas had built up within the capacitor, causing it to burst.

The caps shown in Figures 1 and 2 are identical 6.3V – 1200uF (microfarad) electrolytic caps. The cap on the right in Figure 1 is normal. Notice how it is straight and the metal plate at the top is flat and sealed. The cap on the left has ruptured, the sides have swelled, and its electrolyte has leaked. Some electrolyte is visible in Figure 2 on the cap's left side. The ruptured top is clearly evident on the bad cap.

There are signs to look for. Some caps will simply leak electrolyte, leaving small puddles of brownish liquid. Electrolyte may seep from the cap's top. Over time, electrolyte that has leaked will usually take on a less viscous, sap-like consistency. If puddles are collecting around the base of the caps or there are sticky brown droplets forming on their tops, the caps have failed or are about to fail. In extreme cases, you'll hear a pop and smell a putrid odor from the system. The popping is the cap bursting open. The smell is the insulator in the cap burning up.

Make The Repairs

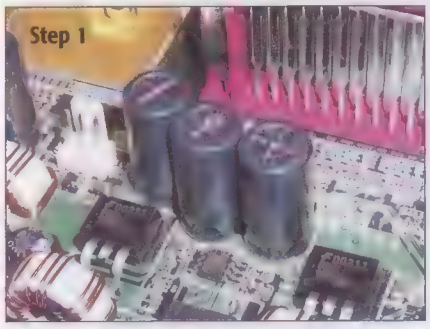
Typically, the electrolytic caps used in the VRM (Voltage Regulator Module) and other mobo sections cost less than $1 apiece. Other equipment you'll need to make repairs is available for about $10. Here's what you'll need and how to do it:

- Soldering iron
- Thin 60/40 rosin core solder
- A desoldering tool
- Wire cutters
- New capacitors

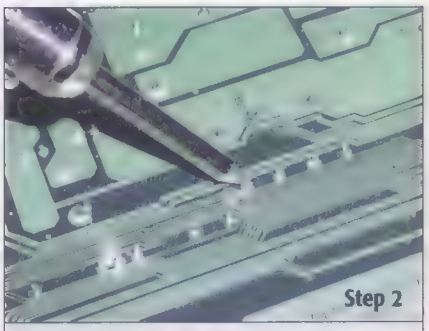
(NOTE: Making these repairs yourself will void your motherboard warranty. If possible, obtain an RMA [return merchandise authorization] from your motherboard manufacturer and have it make the repairs for you. Because capacitors hold an electric charge, there's a chance you may be shocked if you touch both leads. To help discharge the caps, let the board sit a few hours or more on a conductive antistatic bag. Large capacitors, such as those used in televisions or audio equipment, can hold enough of a charge to kill, so be careful.)

Step 1. Remove the motherboard from the PC case and preheat the soldering iron. Inspect the board to locate the faulty capacitors. As mentioned earlier, faulty capacitors are typically swollen or have puddles of electrolyte surrounding them. The capacitors in the accompanying Step 1 photo are in working order, but for our purposes, we'll assume they are faulty.

Step 2. Flip the motherboard over and locate the solder points for each faulty capacitor. Pay close attention to the configuration of the leads so you don't desolder the wrong component. With the proper solder points located, heat the positive lead of the first capacitor to be removed. In a few moments the solder will melt. When it does, tilt the capacitor to pull the positive lead all the way through the board. Now heat the solder point on the negative lead and completely remove the capacitor. Repeat this process until all the faulty caps have been removed. This will require some precision; using the right tools will definitely make the job much easier. The last thing you want to do is damage other solder points or traces that could ultimately render your board useless. To help prevent damage, we recommend using a new tip on your soldering iron with a sharp point to help focus the heat where it's most needed.



Step 1. This image shows three capacitors in the motherboard's VRM before being desoldered and removed from the board.

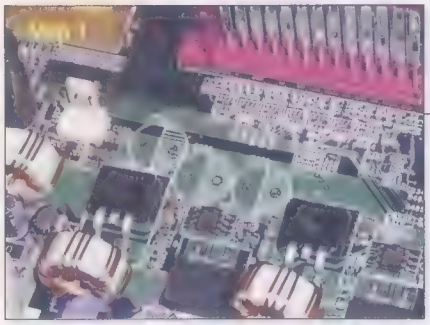


Step 2. These are the solder points on the underside of the board for the three capacitors shown in Step 1. **Step 2a** shows the caps after being removed.

Step 3. After removing the faulty capacitors, you need to remove the old solder. From the underside of the board, carefully stick the tip of the soldering iron into the hole to melt the old solder. Now from the topside, use a desoldering bulb, or "solder sucker," to suck the old solder out. When you're done, the holes should be solder free. In the Step 3 photo, the shaded areas visible in the circled areas represent the negative side of the capacitor. If the motherboard you're repairing doesn't have any markings to help distinguish the positive and negative leads, consider making your own.

Step 4. With the holes clean, you can install the new capacitors. Be sure to replace the capacitors with ones that have identical capacitance ratings and identical or higher voltage ratings. Never replace capacitors with ones that have lower voltage and capacitance ratings. They will fail and could damage your board irreparably.

Insert each new cap into its proper location, paying special attention to get the polarity correct. Now trim the leads with a wire cutter. The capacitor's leads should remain straight, and the cap should sit flush on the motherboard. From the underside

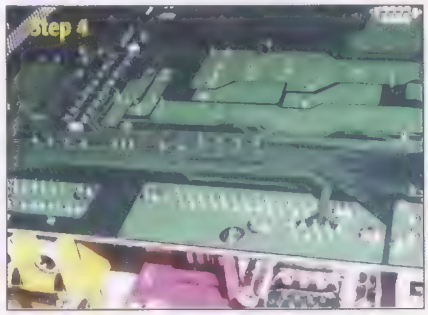


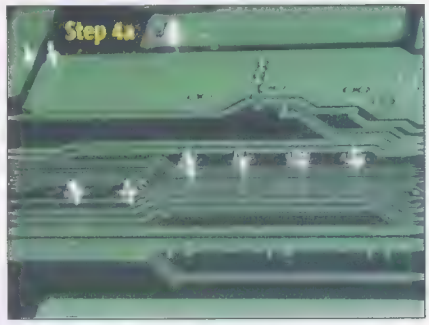
Step 3. After removing the capacitors and old solder from the board, the circled areas show what was visible underneath the caps.

of the board, solder the new capacitors into place. First, heat the negative lead with the soldering iron. To prevent damage to the new caps, don't heat the leads for more than 15 to 20 seconds at a time. Then, with the soldering iron's tip touching the lead, apply a bit of solder. Wait a few seconds to properly heat the solder and pull the soldering iron away. The solder should completely fill the hole. Repeat this process for the remaining capacitors and you're done. If all went well, you're motherboard should be as good as new.

Things To Know

It's best to replace all the electrolytic capacitors in a given circuit. If one cap has failed, chances are some or all of the others in the circuit are marginal as well. In addition, always use new capacitors when doing a repair. As electrolytic caps age, the capacitance values drift. Don't risk damaging your board to save a few cents. Finally, in schematic diagrams the flat part of the capacitor symbol is the positive side. The curved part is the negative side. CPU





Step 4. This image shows the same solder points shown in Step 2 after I replaced the capacitors and resoldered them into place. **Step 4a.** A close-up of the solder points.

VRM Cooling

Hardcore overclockers and enthusiasts know that heat is an electronic component's worst enemy. An overheating video card, RAM, or CPU can cause system instabilities and eventual component failure. To safeguard against these problems, many of us spend small fortunes on custom-cooling solutions, but one potential problem area is often overlooked: the motherboard's VRM (Voltage Regulator Module).

The VRM is usually the hottest part of an average motherboard. In fact, some MOSFETs (Metal Oxide Semiconductor Field-Effect Transistors) in the VRM can reach temps in excess of 212 degrees F. With temperatures that high, cooling is definitely a good idea. Performance gains from this mod can be hard to quantify, however. When was the last time you heard someone say he couldn't overclock his CPU any further because the VRM was too hot? However, the only negatives to modifying your VRM for better cooling are the monetary and time investments. A better-cooled VRM will operate at lower temps for longer periods of time, and if you have a flair for aesthetics, it'll also make your system easier on the eyes.

A standard VRM from a Socket 478 Pentium 4 motherboard after being modified with tin-coated copper heatsinks on each of the MOSFETs.

We took a few tin-coated copper heatsinks, normally intended for use on BGA packaged memory modules, and mounted them to the MOSFETs in the VRM of a mobo in our lab. We mixed a bit of thermal epoxy and applied a smooth, even layer to each MOSFET, taking care not to get any epoxy on the leads. We then attached a heatsink to each MOSFET and let the thermal epoxy dry. A few minutes later, we had a VRM fit for a king.

A few mobo manufacturers are now cooling the VRMs on premium products. MSI began mounting large, aluminum heatsinks to the MOSFETs on its high-end, consumer-class motherboards a while ago (www.msicomputer.com/product/detail_spec/product_detail.asp?model=875P_NEO-FIS2R). Abit took things a step further with its recent IC7-MAX3. This Socket 478 i875 Canterwood-based mobo is equipped with an active-cooling solution that draws air over the VRM and exhausts it from the system's rear (www.abit-usa.com/news/2003/20030725.php). Abit claims this setup decreases MOSFET temps by as much as 50%. ▲

by Marco Chiappetta

Marco Chiappetta is the managing editor of HotHardware (www.hothardware.com), a hardware news and reviews Web site. In addition to technical writing, repairing PCs, and Q&A-tech support work, Marco also builds custom computers.

If you have questions or suggestions concerning performance or aesthetic mods, send them to modding@cpumag.com.

Software Tips & Projects

Make A Better Class Of Slideshow

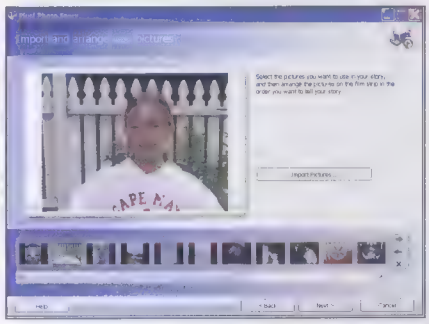
MOST OF US CRINGE AT THE PROSPECT OF SITTING THROUGH SOMEONE ELSE'S TORTUROUSLY LONG FAMILY SLIDESHOW. BEING forced to endure 20 photos of the elephantine Aunt Grace navigating the roiling surf of Lake Tahoe in her ill-fitting two-piece is usually the cue for us to tap our watches and say, "Oops, we told the sitter we'd be back by 8."

This is why we have fallen in love with Microsoft's recent Plus! Digital Media Edition, an add-on specifically for Windows XP that includes Photo Story. This simple slideshow maker lets you present your slides with zooming and panning effects (much like a Ken Burns documentary), synchronized voice narration, and background music. Although the program itself is too rudimentary in some respects, savvy photophiles can combine its capabilities with WinXP's own Paint and Windows Movie Maker 2 editing programs to create more animated, tighter presentations that may keep guests interested past 8 p.m.

This month we will explore some tips we picked up from Microsoft and other users for making the best use of the program. Next month we will port our productions into Movie Maker for more advanced editing and disc-burning options. (You'll need to download the Movie Maker 2 update if you don't already have it.) The DME costs $19.95; you can buy and download it online at www.microsoft.com/windows/plus/dme/dmehome.asp.

The Brain-Dead Gem

Photo Story is cool but dumb in that it has neither built-in image-editing tools nor provisions for saving and re-editing projects.



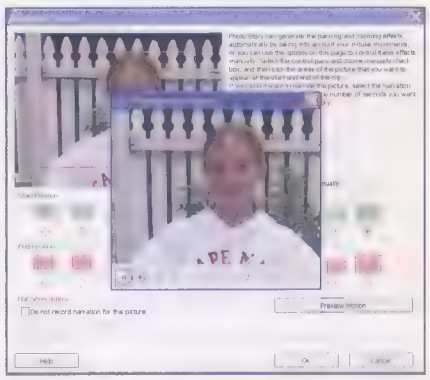
Because your slideshow plays back in Windows Media Player, oversized images with a horizontal orientation will fill the screen most effectively.

Once you start a project, the program holds your hand through the process until the end; we recommend prepping your work carefully before starting a project. Photo Story can contain as many as 150 images.

Advanced users will want to download the special Photo Story Profiles at www.microsoft.com/windows/plus/dme_more/moreprofiles.asp. All Photo Story slideshows become WMV video files for Windows Media Player versions 7 and up, but the default options only allow low-res 320 x 200 or 640 x 480 output. The custom-encoding profiles from Microsoft let you increase the output resolution to 800 x 600 and 1,024 x 768. We'll show you how to use these higher-quality profiles later, but for now, download them to an easily accessible folder.

Before starting Photo Story, review all the images you want to include in the slideshow and make sure they are oriented correctly and cropped as you would like because Photo Story allows for no such editing. Keep in mind that the Photo Story will be run in the Windows Media Player or on your television (see next month's installment), so images that are oriented horizontally are the best fit for the aspect ratio. Also, Photo Story has limited zooming capabilities, so if you want to get in really close on a shot, you will need to crop and blow up an existing image first.

You can get around Photo Story's inherent limitations by making a super-zoom effect out of two versions of the same image. Using Paint, outline an area of the original image you want to zoom in on in the final production. Then copy it, open a new Paint image, and paste it there. Now open the Stretch And Skew dialog box (CTRL-W) and enlarge the image. We blew it up 200% in height and width to keep the original aspect ratio, but make it large enough to fill the slideshow screen. Save this new image so that now you have an original and blown-up version of the same photo. In the slideshow storyboard, you will put the zoomed-out version first and the zoomed-in version second. By using the same zoom-in effect on both in a sequence, you will get the rough effect of a tight zoom.



In the Advanced Options dialog box, you can assign zoom and pan effects manually and preview them in a media player window.

Tell Your Story

Upon starting Photo Story, the program will ask you to configure your microphone and then have you import images into the storyboard. Be forewarned: Our test projects often suffered from weak vocals, especially when combined with musical backgrounds. Choose the Configure Microphone option on the opening screen to ensure that your recording and playback levels are high.

You can get better zoom effects in Photo Story if you enlarge some images before importing them into the slideshow program. You can use MS Paint for simple enlargements.

In the first screen of Photo Story, click and drag images in the storyboard to create your visual sequence. You can also drag images from a Windows Explorer folder and drop them into the storyboard. We took the enlarged image we made in Paint and put it after the original version of the image. Once you have your image sequence set, click Next to go to the next stage.

In the Record Your Story phase, you can add a voice narration clip to each slide so that it is synchronized with the image, and you can add zoom effects. Your narration recording controls the length of time a slide stays on-screen, so if you want an image to linger after your comments, simply remain silent and leave the voice recorder running for as long as you want the slide to remain on-screen. To control a slide's length without narration, click the Advanced button for the relevant slide and check the Do Not Record Narration For This Picture checkbox. Use the settings below this box to set the slide duration manually.

Zoom control. The automatic zoom effects in Photo Story have frustrated many users. The program instructs users to mouse over the areas in the slide they want to emphasize in the zoom, but in practice, the zoom effects rarely respond to this kind of user input. According to Microsoft, this is because the program's built-in zooming algorithms also take into account the start and end point from the zoom in the previous slide. We got the best results by overriding the auto-zoom altogether. So once you have recorded your narration for a slide, click Advanced and then check the Control Pans And Zooms Manually checkbox. Use the radio buttons in the Start Position and End Position areas to establish where the zoom or pan begins and ends and use the Preview Motion button to check the effect. Click OK to return to the storyboard.

You can do some makeshift animation tricks by loading multiple instances of the same image into the storyboard and playing with the pan effects and slide-duration timing. Take any slide and click the Advanced button. In the Narration Options section, turn off narration and set the duration time to one second. Now add a pan or zoom effect. You will see that the effect is accelerated to finish within a second. You can string several instances of the same rapid-pan images in succession on the storyboard to create manic and playful movements.

Credits & Soundtrack

After finishing the narration and zoom editing on your project, clicking Next prompts you to make a title page. Photo Story only lets you import a background image and place a title and author in just a few positions on the slide. A good workaround is to dispense with the title slide option by deselecting the Add A Title Page To Your Story checkbox. Now you can just craft a title image in an image-editing program and place it as the first slide in the Photo Story. Even at this late stage in creating the slideshow, you can still use the Back button to return to the photo import and narration sections to add new images and modify narration and effects.

When you're done with the title slide page, click Next, and Photo Story prompts you to add background music. You can use WAV or MP3 files, and the slider sets the playback volume. Make sure you use the Preview button to test how well your narration stands out over the background track. Photo Story only lets you use one track.

Finally, clicking Next brings you to the quality settings options. Here is where the custom profiles that you downloaded earlier come into play. Click the Advanced button and then check the Use Custom Encoding Profile checkbox and browse to find the PRX format file for either 1,024 x 768 or 800 x 600 resolutions. Keep one thing in mind, however: In order to fill your screen with the images in your slideshow, keep the playback resolution at the same size or smaller than the resolution of most of your original images. In our test projects, we found that using images of a higher resolution than the playback profile results in better zoom effects and images that fill the media player screen.

Next month we will edit your production further in Movie Maker 2 and burn it to DVDs for playback in your living room. CPU

by Steve Smith

Registry Tweak (WinXP)

Get More Downloading Sessions

By default, Internet Explorer lets you download only two files simultaneously from a single Web site. When you ask for more than two downloads, these additional requests wait in line for one of the two download sessions to open up. To allow up to 10 download sessions at once, go to HKEY_CURRENT_USER\SOFTWARE\MICROSOFT\WINDOWS\CURRENTVERSION\INTERNET SETTINGS. Add a new DWORD Value named MaxConnectionsPer1_0Server. The Value you give it will determine the number of download sessions you can open from a single Web site, so give this new DWORD a Value of 3 to 10. Create another DWORD Value, name it MaxConnectionsPerServer, and give it a Value of 3 to 10. This tweak requires a system reboot to take effect. ▲

Warm Up To Penguins

Civilization With Style

Sometimes you just have to play the game. In the case of the Linux world, one of the more popular games is Freeciv, a Civilization clone that comes with most Linux distributions. (The game also runs on Windows, Mac OS X, and other OSes.) What does not come prepackaged, however, are the various customization packs available.

If you are bored playing the vanilla Freeciv version, spice things up with sounds, graphics, themes, new opponents, and more. There isn't enough room here to discuss all the basics of running and using Freeciv, especially considering the complex nature of gameplay. Fortunately, there's plenty of helpful data on the Web.

Get The Latest Version

To locate the available updates for Freeciv, point your Web browser to the Freeciv Web site (www.freeciv.org). Once there, the first task is to download and install the latest version of the game. Look to the Download Freeciv section on the home page or click the Download link in the Get Started section. Look to the Current Stable Version section for the latest version. You can check this version against your own by launching your Freeciv server, which details the version number at the top of the screen.

If the site's latest stable version is newer than yours, go to the Download page. In the Binaries section, you'll find an impressive list of versions for various Linux distributions and flavors of Unix. We're using Red Hat Linux 9 on a Pentium-class machine, so we looked to the third column (Download File) and selected the Freeciv 1.14.0 RH 8 i686 (server + GTK+ 1.2 client) link.

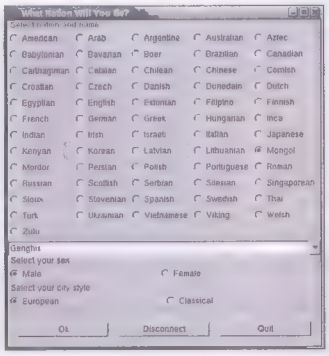


Figure 1. The Freeciv 1.13.0 client's Nation Selection dialog box, full of existing and historical civilizations.

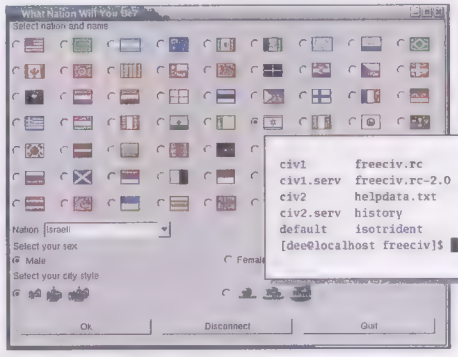


Figure 2. The Freeciv 1.14.0 client's Nation Selection dialog box with the addition of flags and other changes.

After you download a file, you'll need to use the su command at a command prompt to temporarily become the root user. Then use your distribution's package-management system to handle the installation. Now, run the new version before proceeding; it will help you see the new baseline to compare the add-ons to. For example, when upgrading from Freeciv 1.13.0 (the version included with Red Hat Linux 9) to Freeciv 1.14.1, you'll see significant changes in the Nation Selection dialog box.

Install Tilesets

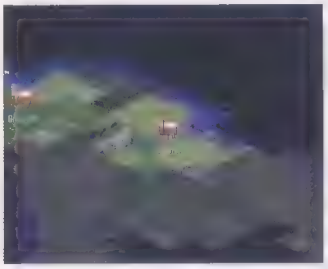
On the Download page, you'll find various add-ons, including tilesets, nations, modpacks, utilities, and sounds. We'll focus on tilesets, which are collections of the images used to make up the game's world. Check the tilesets you have installed by viewing your Freeciv directory, which is located in /usr/share/freeciv if you're using Red Hat Linux. Searching your file system from a command prompt by typing **locate freeciv** or **find / -name freeciv** will help you find your version of this directory.

In our directory are files ending in the .tilespec extension. These tell us that we have the isotrident, trident_shields, and trident tilesets installed. Typing **more ~/.civclientrc** at a command prompt shows which tileset we're currently using. (If this file is empty, you need to start the client and select Game | Save Settings before proceeding.) Look for the default_tile_set_name entry, such as this example: default_tile_set_name="isotrident".

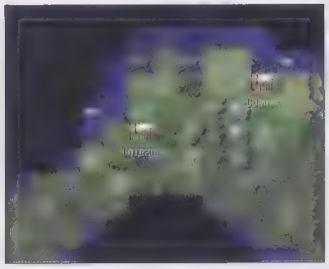
```
civ1        freeciv.rc      isotrident.tilespec   stdsounds.soundspec
civ1.serv   freeciv.rc-2.0  misc                  trident
civ2        helpdata.txt    nation                trident_shields.tilespec
civ2.serv   history         scenario              trident.tilespec
default     isotrident      stdsounds
[dee@localhost freeciv]$
```

Here you see the contents of the /usr/share/freeciv directory on a Red Hat Linux 9 system with the Freeciv 1.14.0 update installed. The directories are color-coded in blue for easier viewing.

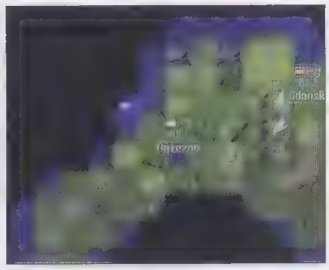
To try the trident_shields or trident tileset, we would replace isotrident with one of the other items. What's cool here is that you can change your tileset any time. Just close your client while leaving the server running, change the tileset settings, and open the client again. Connect



Freeciv version 1.4.10 with the isotrident tileset installed.



The Freeciv world with the trident tileset in place.



This image shows the trident_shields tileset installed.

The Freeciv world with the r-hires tileset shown.

with the same username, and you'll return to where you left off.

What about tilesets on the Freeciv Web site? The Linux version of Freeciv is changing its graphics format, so if you're using version 1.14.0 or earlier, you can't use tilesets designed for earlier Freeciv versions. Keeping that in mind, when you look to the Download page's Tilesets section, you'll see that most tilesets don't list their Freeciv versions. Check this by looking to the left-hand column. If it says "up to date," the tileset *should* work with the latest release. Just be aware of the 1.14.0 change point.

Click a tileset's name to download it, such as r-hires3. Use bunzip2 and tar commands to access the files, and then change to the directory that tar creates. Within r-hires, you'll find a collection of files and directories that resembles this:

```
drwxr-xr-x  2 dee dee 4096 Sep 13 2002 r-hires
-rw-r—r—    1 dee dee 1052 Sep 13 2002 r-hires.README
-rw-r—r—    1 dee dee 1260 Jun 10 2002 r-hires.tilespecec
```

Read the Readme file first so you know what to expect. Then, before you can load this tileset into your Freeciv client, move the files into place. Begin with the r-hires.tileset file, and move it into /usr/share/freeciv. Now, move the entire r-hires directory. (This isn't the same r-hires directory that the tar program unpacked everything into. Instead, you'll copy over the r-hires/r-hires directory.) Now add r-hires to your default_tile_set_name statement and start your Freeciv client. You can use your preferred tileset even if playing on the public servers.

Play Against Other Humans

What exactly does "public server" mean? Essentially, you can play Freeciv by yourself and against AI opponents, but also against other people via public servers. Before you try, however, spend some time learning the ropes on your own.

When you're ready to join a game, start your Freeciv client. In the Connect To Freeciv Server dialog box, click the Metaserver tab and click Update. You'll find a list of available servers, some with games already running. Select one of the games that hasn't started and that matches your client's version. Now, click Connect. If you try to connect to a game in progress, you'll be rejected, and the explanation will print in the text segment at the bottom of your main Freeciv client window.

After you connect to a game, wait for others to arrive (they'll be announced in the text section when they connect) or type **/start** in the lower text bar to begin. Try playing on an empty server to try out this new venue. You'll be assigned a single AI opponent. From there, you can work up to two, three, and more human opponents. The results of public games are recorded on the public server site at Pubserver.freeciv.org. You can also find player rankings and learn how to set up your own public server. Player rankings are only recorded for games that have 10 or more players.

It's Your World

Freeciv is one of those addictive strategy games that just may hurt your productivity. Adding custom tilesets, sounds, and other small widgets can enhance your playing experience without interfering with your ability to participate on the public servers. When you begin adding modpacks, new countries, and other more complex features, you will have to keep two separate client/server configurations so you can play your fancier setup on your own and then play a more standard setup on the public servers. CPU

by Dee-Ann LeBlanc

Infinite Loop

Thank Goodness Someone Tackled The Data Storage Problem

Twenty-five years ago, the 5.25-inch single-sided floppy diskette first gained widespread usage. The original held just 160KB of data. To put things into perspective, you would need 4,480 floppies to back up just one standard CD-R. You could lay those 4,480 diskettes end to end to create a border for two football fields.

Furthermore, if you copied the contents of 53 CD-Rs to 5.25-inch single-sided floppies, you would use 237,440 floppy diskettes, enough to completely cover a football field. And you'd still have 2,142 floppy diskettes left to throw onto the field after the big win.

by Mike Magee

Grok This

Would you grok it? Yeah, we know that "grok" is only a verb in fiction books by science fiction writer Robert Heinlein, but you must allow us artistic licence if rumours are to keep peeling off the wood mill. Half-Life 2 seems to be delayed until next year but that hasn't stopped an unholy war from starting between ATI and NVIDIA over which graphics processor is suitable to run the game, with Valve at press time writing in the former's favour. Sources close to ATI claim that it paid Valve $6 million in a crazy auction in which only ATI and NVIDIA were bidders.

The ATI sources admit that the passage of money to Valve probably does have an effect on what the games people say in public. One question sources close to ATI are asking is how much NVIDIA will pay for the privilege of bundling id Software's Doom III when it arrives probably in the first quarter of next year.

Sources close to ATI claim that it paid Valve $6 million in a crazy auction in which only ATI and NVIDIA were bidders.

Why do chip manufacturers including NVIDIA, ATI, Intel, AMD, VIA and others all use Microsoft PowerPoint presentations to leak their roadmaps to the press? No one knows. But we hear that the very latest version of Microsoft Office 2003 (plus of course, "Trusted Computing") has watermark characteristics that will prevent such leaks from ever happening again. That means the chip manufacturers will all have to go back to using paper, SMS texting, and even the traditional spoken word to ensure maximum press for their announcements.

We've heard that if you've got a trusted computer complete with a TPM module from third party manufacturers like Alcatel and National Semiconductor, how do you reboot the machine if everything's gone awry and it no longer works—especially if the module's embedded into a motherboard? This is a real conundrum that the Trusted Computing Consortium hasn't yet got round to addressing.

Intel and its PC partners have, we understand, gotten around to addressing a problem with the Pentium M and the Centrino bundle. Firms that don't have a tier one notebook accreditation from Intel apparently can't afford to join the MDF (marketing dollar fund) schemes Intel cooked up. The reason is that you only qualify to become an "accredited" Centrino consumer of Intel marketing funds if you sign up to buy a certain amount of product from the chip giant first. As Intel keeps dropping prices on Pentium M and its associated products every few months, this perfectly explains why you and I are seeing so few notebooks around with the Centrino brand apart from the big boys' offerings.

It's got nothing to do with technology; like me, all tier two notebook makers are convinced Centrino is fantastic. It's all about dollars. That's why there are so few mini-sized PCs using Pentium M processors for the desktop . . . so far. The price of the chip and the price of the Intel server or notebook chipset mean only a fool would want to pay over the odds for this combo rather than a Pentium 4. However, some foolhardy souls are pinning hopes on notebook chipsets not only from the very charming SIS (Silicon Advanced Systems), but also from VIA and maybe even ATI and NVIDIA too. As these firms won't charge an arm and a leg for their notebook chipsets whether the microprocessors are Pentium Ms or Athlon64-Ms (that's the kind of machines they're making right now). Intel appears to have priced itself right out of the notebook market; that's the gut feeling on the Taiwanese front.

Well, there's one thing that Intel is not, and that's financially stupid. But imagine the reaction of the desktop processor faction if suddenly Pentium Ms became the flavour of the day in small form factor PCs, and even in your average very quiet desktop? The desktop division, with many thousands more people than the 600 strong notebook division, and concerned at the sheer skill of the "mobile" folk in Banias, Israel, would go abso-bananas in an uber-processor feud! Heads might roll. Now it's back to toiling at the rumour mill. Until next month . . . ■

Send rumours to "Mad Mike" Magee at Mike@cpumag.com.

Mike Magee is an industry veteran. He cut his teeth on ancient products like the Dragon and the Japanese PC platforms long before the IBM-PC won. He worked for a corporate reseller in the mid-'80s and saw the Compaq 386 sandwich box and every GUI known to humankind. Mike decided that the way to go was the Interweb around 1994 after editing PC mags in the late '80s and '90s. A co-founder of The Register, Mike started the chip-driven INQUIRER (www.theinquirer.net) in 2001. He has contacts from top to bottom in the business, spanning the entire chain, who help him root out interesting rumours and speculation.

Technically Speaking

An Interview With Tim Ryan, M-Audio's Music Man

M-Audio is already well-known in professional music circles, but the company is only now just becoming better known in the consumer world. Tim Ryan, the company's president and founder, made his first splash with PC enthusiasts with the 7.1-enabled Revolution card (he also founded Cambrio Digital Synthesizers back in 1977), but that was only the beginning.

Ryan sees a long and amazing road ahead for consumers in which the world of stereo will be a quaint memory. That road will be littered with its share of dead coulda-beens, but Ryan thinks the foundations of tomorrow's audio revolution are already in your PC.

by William Van Winkle

CPU: What was the first big product in your career?

Ryan: I founded a company called Cambrio Digital Synthesizers while I was out at Cal Tech in '77. We created what I'd call the grandfather of most of the synthesis technology you've seen today with digital oscillators that were multiplexed and the ability to AM and FM them and configure them in any way. You could analyze real instruments and turn them into moving, changing frequencies and so on. These instruments were like $30,000 apiece, so we didn't sell very many. I was kind of green in the music business and thought if we made the best instrument on the planet, people would buy them no matter what, and that just wasn't the case. I learned that musicians basically didn't have a lot of money, which is fine, but you have to provide people with what they need and can afford.

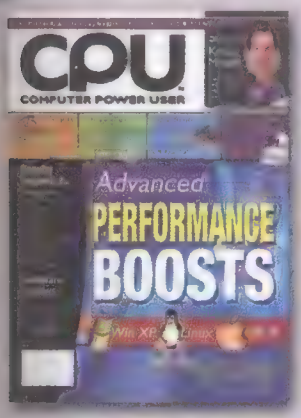
CPU: It seems like you took that lesson to heart years later when you went into the consumer business with the Revolution card.

Ryan: Absolutely. One of the things that got us going with Cambrio was I was looking at EMU stuff at the time and how much they were charging to make these very simple oscillator circuits. They were like $400, and the BLM [bill of materials] on them was like $20, so we thought we could make this thing and sell it for $100. Unfortunately, our technological appetite was greater than our common sense or business, and we got carried away, as technical guys will do, and kept making something better and better until one day we looked up and found we'd drifted very far from the original premise, which was doing a lot of really neat things for cheaper.

CPU: Creative is a great company with great products, but as the current owner of EMU technology and one of your big rivals, would you say Creative is overpriced?

Ryan: I think they're undertechnologied. Five years ago, we would get calls from guys that had Creative Labs cards, and they said, "We understand you're making really good cards. My Creative card does not sound very good. I'd like to upgrade to yours." So we got a Creative Labs card in the office and started measuring it. They were getting like 70dB signal-to-noise, and we started looking at how they were doing stuff. Frankly, there was just no attention or expertise in how to get the best audio, even out of what they had on that card at that time. They weren't attempting to overshoot the mark. They never thought, "Hey, if you put another four man-months into the card, you'd probably get 85dB signal-to-noise."

Anyway, we started scrutinizing the cards more and more, and suddenly we realized we could actually bring the cost



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of what we were doing down to be able to compete with Creative. With the digital audio approach instead of AC97 codecs and so on, we could give it a run. We couldn't do the bells and whistles that they were doing because they were putting a lot of highly integrated stuff into ASICs that were proprietary to Creative, but they were all aimed at that sort of low level of audio performance. Our thinking has always been that as the computer gets faster and faster, the stuff that Creative had been having on the card becomes less and less important. You let the computer do things, with like Sensaura, in order to do the room emulation and so on. It provides better audio ultimately at a lower cost because you're not burdened with all this junk DSP on the card, which always seems to degrade the performance.

CPU: Let's go to the other extreme. You can plant a very good VIA audio chip on a motherboard for $2 or $3. A perfectly good C-Media chip with 5.1 and everything else costs a buck.

Ryan: Yes.

CPU: So where is the value for consumers in discrete audio, especially after another generation or two of onboard development?

Ryan: There are two parts to this discussion. One is music industry talk, which addresses sound-creation people that need many more outputs than inputs. This is a completely different market than the playback side, which is where Creative has led and where the Revolution addresses. Your question is really about playback.

Creative was selling add-on soundcards well after the PC and Mac had built-in codecs. So what's the value-add that they bring to this proposition, and is it sustainable? If you put something on the motherboard and the motherboard manufacturer's worrying about every dime, they're not going to use the quality of converters and stuff. There's a real hardware cost constraint that has been borne out in principle by the fact that Creative Labs is still in existence. Every nickel means something to those motherboard manufacturers. If they've got a dollar to put into that audio section, they aren't going to put three dollars in, let alone grapple with the idea of how you get the best audio on a motherboard, how you isolate the grounds, lay shielding, and all that sort of stuff.

The difference is going to show itself in signal-to-noise ratio. If you put a VIA solution down on a board, which is a great solution by the way, they're going to be, let's say, at 85dB signal-to-noise on the average PC, whereas our soundcards are getting 105. A year from now, they're probably going to be at 90. Five years from now, they're probably going to be at 100. We're probably going to be at 120 then.

CPU: Does that really matter to an average user?

Ryan: Usually no, and that's the point. We're not Creative Labs. We're not selling $800 million of sound cards. The box is going to get smaller and smaller for them, and they're having to offer higher and higher performance sound cards with better audio and presumably more features. So $800 million of Creative sound cards go down to $50 million over the next five years. Who do they sell to then? The audiophile. They continue to differentiate themselves from the motherboard because they offer superior solutions, but they're rowing upstream because they're having to row against the fact that the quality of the motherboard solution gets better and better.

CPU: You're rowing up the same stream, though?

Ryan: Well, no, not really. Our market is the discriminating user who wants better audio, and Creative's market has been "Everyman," and the Everyman market is diminishing as onboard solutions get better and better.

CPU: Is there a point of diminishing returns with signal-to-noise? Creative had 106, then you did 107, and now Creative has 108. Can I even hear this?

Ryan: Probably not, although some people can. Let's say they're at 100dB. Can you hear the difference between 100 and 110 if we stick you in a room? Yes, you could hear it. If you were a consumer with some lousy Altec speakers, could you hear it? No. Until the speakers get better, you aren't going to hear it, and unless I put you in a room and play both of them for you, you won't even know it. But I can take you into a listening room with those cheesy Altec speakers and our state of the art LX surround speakers and you'll sit there and you'll just s***. You'll go, "I can't believe they sound that bad and that's what Everyman is listening to at home." Now, I don't fool myself. The difference between $200 and $400 from a consumer's standpoint could be worlds apart, but is there 10% of the market out there that will tell the difference between good and bad speakers? I think so.

CPU: You believe that surround playback is the way of the future, but NVIDIA seems to be reconsidering that idea. The nForce2's Dolby Digital encoding APU got yanked away from the nForce3 and is destined for discrete cards. What's your take on that?

Ryan: That is what SRS and other matrixing schemes are for. You're talking about stereo content being fanned out to surround?

CPU: Right. That was the big draw for Dolby encoding.

Ryan: I agree that there has to be a matrixing technique to take stereo and turn it into multichannel content, but that is built into our driver. It ought to be essentially given away or available at a very nominal charge because those algorithms are very reasonable to license. CPU

To read our entire interview with Kent Larson, go to
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Under Development

A Peek At What's Brewing In The Laboratory

Soaking Up Sponge Tech

Bell Labs made headlines in March 2002 when its researchers announced they could successfully transmit data across 2,500 miles of fiber-optic cabling. However, as good as today's synthetic fiber optics may be, Bell scientist Joanna Aizenberg recently discovered that the glassy sponge that grows in the depths of tropical oceans (and is nicknamed the Venus flower basket) leaves even the best man-made optical fibers far behind.

If Aizenberg's name looks familiar, it's because she made this column in the May issue (page 106) for her work with naturally near-perfect lenses found in brittlestars. But glassy sponges are entirely different creatures. They stand roughly 18 inches tall and sport a skeleton made of silica fiber mesh. Each skeletal fiber is 2 to 7 inches long and roughly the thickness of a human hair. Although no one knows for sure when the sponge evolved this amazing structure, the best theory going is that when symbiotic bioluminescent organisms cuddle up with the sponge, the optical fibers pass this light upward, illuminating the sponge like a Christmas tree, so that more symbiotic creatures are drawn to it.

"Although commercial fiber is great at transmitting data over long distances, it sometimes fails because it cracks," says Saswato Das, Bell Labs spokesperson. "Engineers try to prevent this by wrapping plastic around the glass to give it a little more flexibility, but cracking is still a problem. When fibers break, you have to dig them up, and it's a long, costly process for everybody. The biggest way nature seems to have improved upon us is in flexibility, and that is what we are trying to learn from with this deep sea creature."

The other significant aspect of the glassy sponge is that although man-made optical fibers must be constructed in costly furnaces, this organism manages to perform almost the same task in the dark ocean chill. ▲

Bell Labs researchers have dredged up another discovery from the deep sea. This time, the glassy sponge may teach engineers a few lessons on how to construct better optical fibers.

One Expensive 5-Year-Old

Honda's ASIMO robot, now wowing crowds worldwide, is proof that Japan rules the robotics field. Yet researchers aren't satisfied. They want a commitment from the government that's on par with America's old Apollo or Manhattan projects: great endeavors that seeded many new technologies and industries.

Japanese researchers want the government to spend 50 billion yen per year the next 30 years to create a humanoid robot with the physical, mental, and emotional capabilities of a 5-year-old human as part of The Atom Project, named for the 9-year-old animated robot hero, Tetsuwan Atom, or "Astro Boy." According to *The Japan Times*, the Apollo Project cost America more than $20 billion. That's equivalent to 7.2 trillion yen at 1960s exchange rates.

The anime character "Astro Boy" doesn't look much like the DB robot Mitsuo Kawato designed, but Kawato wants Japan to fund an effort to create a robot with the traits of a 5-year-old human.

One prominent researcher pushing the project is Mitsuo Kawato, chief of the Computational Neuroscience Laboratories at the Kyoto-based Advanced Telecommunications Research Institute International. Kawato's group designed the DB robot, which can perform more than 20 actions that it learned through observation, not direct programming.

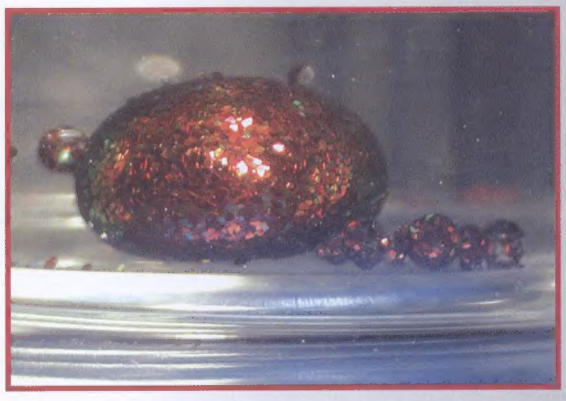
"Most of today's robots operate with a program written by humans," Kawato stated. "... to develop a robot that can think and move like a 5-year-old, we have to first understand the mechanism of how human brains work."

Japan's present economic circumstance makes such massive funding unlikely. Conversely, Japan has a declining birthrate and a booming elderly population that could benefit immensely from the services of domestic robots. ▲

by William Van Winkle

Smart Dust Is More Than Meets The Eye

While Japan struggles to make a robot that can think, researchers at UCSD (University of California, San Diego) are aiming to design granule-sized robots that can self-assemble out of practically invisible particles. That's the long-term vision, anyway. For now, the UCSD team, led by professor Michael Sailor of the Department of Chemistry and Biochemistry, is happy with the first step it has taken: creating particles roughly only 50 micrometers wide (about the width of a human hair), that can sense their environment, orient themselves, and self-assemble into a larger entity.



No, that's not a giant, man-eating blob. It's actually a blob of oil in water crusted with "smart dust" designed by University of California, San Diego researchers.

To do this, the team used porous silicon chips fashioned as a red mirror on one side and a blue mirror on the other. Each side was additionally modified with chemicals designed to find and adhere to a desired target. In this case, the chemical was hydrophobic, meaning it repels water and attracts oil. The opposite side was made hydrophilic, or attractive to water. The chips were broken into dust-sized bits and poured into a beaker filled with water and a dollop of oil. Predictably, the particles clumped around the oil with the hydrophobic side clinging to the dollop.

"Think of the particles as something akin to a virus," says Sailor. "They can move through their environment by random diffusion. When they find a surface they recognize—the chemistry on the surface is complementary to their surface chemistry—then they stick."

More interesting, though, is that because the silicon is porous, some particles from the oil and water absorb into their respective particle sides, and the original chemical coating changes color slightly in response to the exact oil or water composition. Individually, the dust particles are too small to have their new colors detected, but because they self-assemble into a larger group, their combined reflection makes detection easy, even with the naked eye. In this way, the particles can be used for chemical-element detection, which may have promise in medical and military fields.

"One day, we want to put arms and legs on these structures, but that's not what we're doing just yet," says Sailor. "They are not as sophisticated as transformers. They have the ability to assemble into a larger, more complex structure, but not into anything like an anthropomorphic being. The main thing we demonstrated was that the larger structure sets up a coherent mirror to allow the complex assembly to signal to the outside world that it has found the surface more easily than would an individual particle." ▲

IBM Stretches Speed In Strained Silicon

IBM is no stranger to chip-fabrication-breakthrough headlines. What is more unusual is scoring two headline stories at once.

Besides shrinking feature sizes, one of the biggest challenges facing the CPU industry is how to make electrons move faster through device channels. One previous IBM breakthrough was the use of strained silicon—a stretched layer of silicon sitting atop another layer of silicon germanium—to achieve a roughly 30% performance improvement. Unfortunately, most manufacturers found germanium too difficult to adopt into their processes. IBM is now announcing that it can produce germanium-free strained silicon without any reduction in the process' performance gains.

With this news comes word that IBM has also devised a way to alter a wafer's silicon structure for up to 65% faster speeds. The crux of the advancement revolves around the electrical charge of transistors on CMOS (complementary metal-oxide semiconductor) chips. Transistors feature either positive or negative charges, but most chips are optimized for negative transistors. To get equivalent performance out of a positive transistor requires more space on the chip. IBM designed a silicon substrate for transistors that uses molecular crystals aligned in two directions. Positive transistors work well on one alignment while negative transistors prefer the other. The new process requires no change in fabrication equipment.

This image illustrates IBM's latest chip-accelerating breakthrough: CMOS devices on a hybrid orientation silicon substrate.

IBM will be the first to bring these two new approaches into production with its own troubled chip business. From there, Big Blue hopes to license the technologies throughout the industry, which is still desperately casting about for cheap ways in which to extend Moore's Law. ▲

Q&A With Alan Kay

While at Xerox PARC, Alan Kay conceived of the windowing GUI—a design that Steve Jobs and his early Apple colleagues "borrowed" from Xerox and that Bill Gates, in turn, borrowed from Apple. Kay participated in designing the ARPANet, the Internet's predecessor, as well as 3D graphics, and he worked with the teams that invented laser printing, Ethernet, and a host of other foundational technologies. He invented the Smalltalk programming language, which would go on to spawn a legion of other object-oriented languages. From Xerox PARC on, most of Kay's efforts have been with children and helping them work with computers in a more comprehensive, thoughtful manner.

Q Is there anything equivalent to the old Xerox PARC in action today?

KAY: Xerox PARC was set up by Bob Taylor, one of the ARPA (Advanced Research Projects Agency) directors in the 1960s. He had paid for all of our Ph.D.s and handpicked us for PARC. It's very difficult to explain what that process was like today because, in spite of the success of this funding, there is no comparable funding by either government or corporations today. That's an interesting question to ask: How could this possibly be true? I mean, PARC alone has been estimated to have produced $6 or $7 trillion worth of wealth. But in spite of that, nobody is funding these processes today and hasn't for quite awhile.

Q One of the biggest epiphanies in your life came from seeing Seymour Papert's Logo language in action with children.

KAY: Yeah. I'd started thinking about what it would be like to have your own personal computer at home or in your office. You'd have an object-oriented system of great simplicity and power, and you'd be able to make simulations of the ideas you're interested in. It was in 1968 that I finally visited Seymour Papert to see what he was doing with Logo, and it just completely blew my mind. I have a degree in mathematics among other things, so I could see that Seymour was teaching real deep, powerful, and important mathematics to children. In fact, a lot of the math he was teaching to them—differential geometry—no child in the country ever gets, even all the way through high school. The fact that the computer could be used for learning powerful ideas by building them and so forth just completely knocked me over.

Q Tell us a bit about your kid-friendly programming system, Squeak.

KAY: Squeak has been around since 1996. We had been doing a lot of research at Apple with schools and children, so we decided to do a new system, partly to implement some ideas and have something where we could see how they work with children and partly with the aim of putting a few thousand pieces of 21st-century content out on the Internet. Basically, we built a whole new approach to personal computing still reminiscent of the stuff we'd done at Xerox PARC. If you're a hacker, the place to go is squeak.org. This is a worldwide open-source process, like that of Linux. We have thousands of people working on it all over the world. The Squeakland site (squeakland.org) talks about the stuff within Squeak that is directed at children specifically.

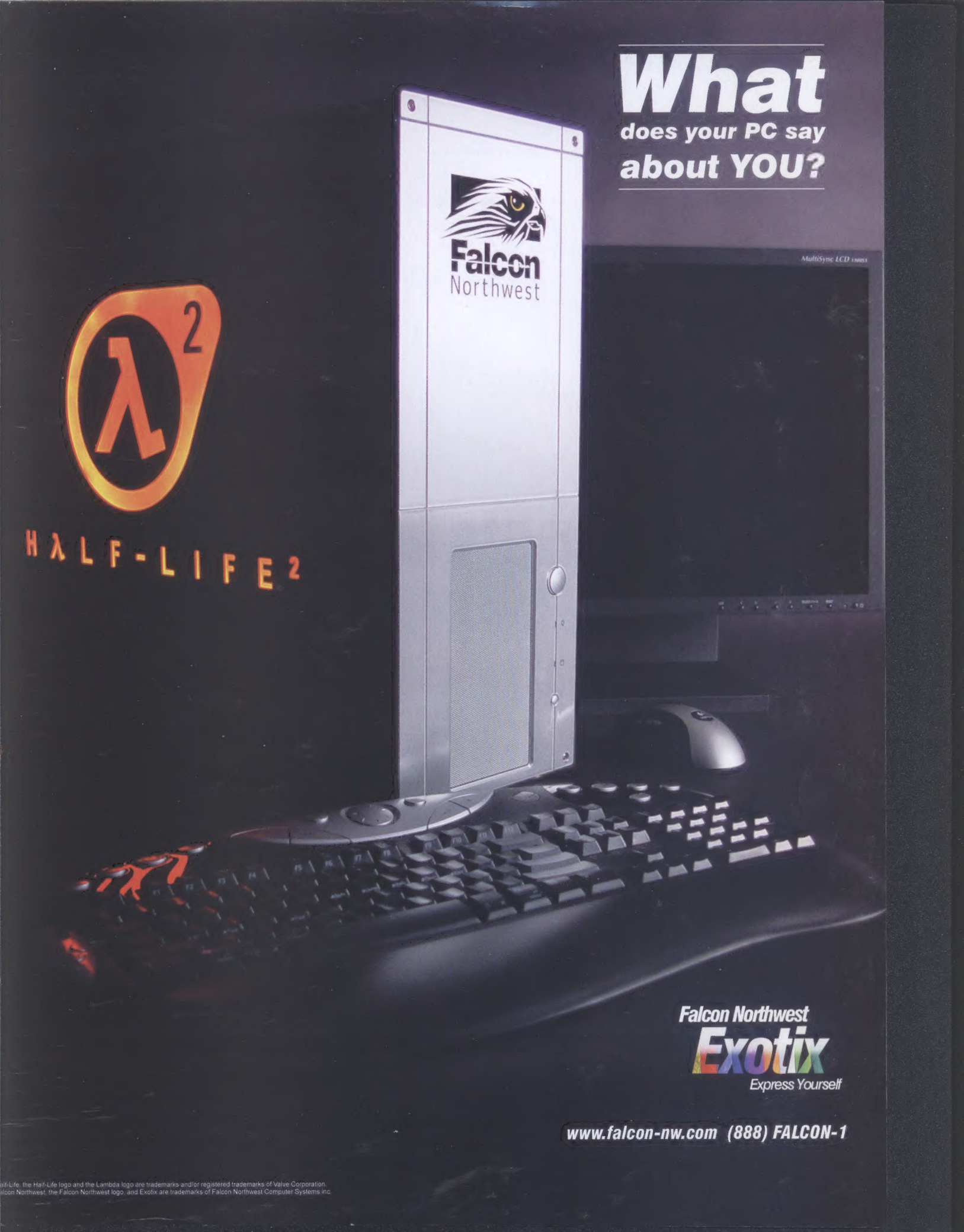
Q You stated several years ago that the computer revolution hasn't happened yet. Is that still the case?

KAY: Yeah. It's similar to when did the printing revolution really take place? Most people, I think, would say not 'til the 17th century, when politics and science changed in a remarkable way—about 200 years. We're still mostly in the first 50 years of printing when the Gutenberg press was used to imitate manuscript writings, particularly the Bible. The Gutenberg Bibles were an attempt to look exactly like the handwritten manuscripts that the monks did, and it took about 50 years until people started thinking about making little portable books that were cheap that everybody could buy. We can think of these cheap laptops that are starting to happen now as that key portable media that's taken about 50 years. The real question is: How long is it going to take for thought to change and the ways that the computer can help with the change?

When we started this stuff, we knew it was going to take awhile to do this. I suspect it's not going to take another 150 years, though it might take another 50.

Subscribers can see www.cpumag.com/cpunov03/kay for extra interview content.

William Van Winkle began writing for computer magazines in 1996. He was first published in 1990, the same year he took his first job in computers. He and his family live outside of Portland, Ore.



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